JAN 18 1917 (C)

INDUSTRIAL NUMBER

THE HEATING AND VENTILATING MAGAZINE

Vol. XIV. No. 1
$1.00 a year. 10 cents a copy

JANUARY, 1917

Published at Cooperstown, N. Y.
New York Office, 1123 Broadway

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 11 E. 42ND ST. 188-200 FRANKLIN ST. BOSTON.

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Adjustable

For the UNIFORM distribution of fresh air in auditoriums

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Continuous Night and Day Records of temperature help managers and superintendents to secure and maintain uniformly efficient operating conditions.

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Recording Thermometers
for this reason have proved to be well adapted for use under ordinary shop conditions and are unique in their extreme simplicity of construction, and durability in service.

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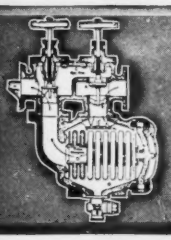
Branch Offices: Boston, New York, Chicago, Pittsburg, San Francisco



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Will Keep Oil Out of Your Boiler
Regulating Valves for Water, Steam, Air
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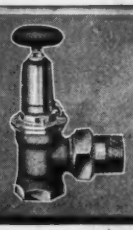

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PACKLESS RADIATOR VALVES
Insure Satisfaction
A Valve for every System
Write for Catalogue and Discounts
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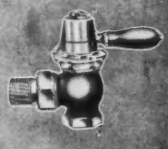
208 NORTH FIFTH AVENUE CHICAGO



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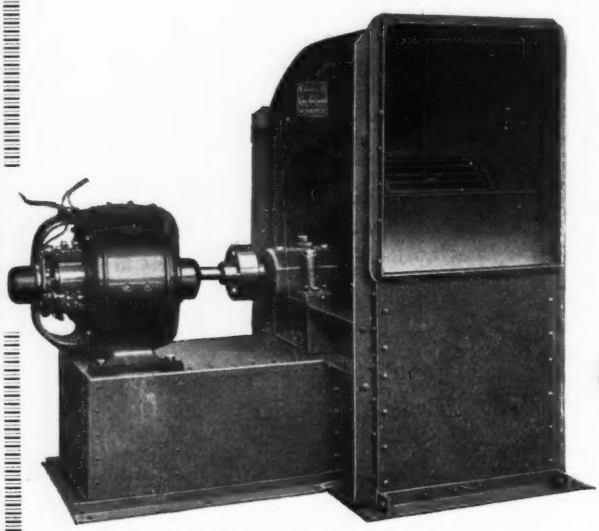


...An Advertisement

BY THE

CLARAGE FAN COMPANY.

KALAMAZOO—MICHIGAN—U. S. A.

New York Cleveland Chicago

A considerable number, and a constantly increasing number, of the better class of Architects and Engineers have placed their stamp of approval on Clarage-Kalamazoo Fan Equipment.

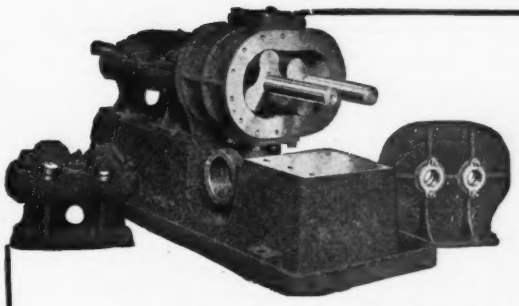
The chief reason for this lies in the fact that the First Thought back of both the Design and the Construction of these Machines, has always been—Can We Build a Better Fan? The Multiblade Type of Fan shown in the cut above, will be found at least the equal—both in efficiency and in the details of construction—of any similar type on the market.

In certain details these fans offer undoubted improvements. In the Fan Bearings, which are after all the only part of such a machine which is subject to wear, the Clarage Design includes not only an Enclosing Case for the self-aligning, babbitted sleeves, but makes this case Oil-tight and Dust-proof by Felt Washers which fit closely around the shaft. The Oil Reservoir is also of unusually large capacity, which reduces the attention required.

A more complete description of these fans is given in our Catalog No. 5, which will be sent upon request.

You will make no mistake if you specify and use the Clarage Fan Apparatus on your work.

Builders of Steel Plate Fans, Exhausters, Heaters, Engines, Volume Blowers, Pressure Blowers, Blast Gates, Ventilating Fans, etc.



Don't Make This Mistake

If you have made the mistake of installing a cheap, unsuccessful Rotary Pump, do not make the further mistake of concluding that all rotary pumps are worthless.

Instances of this kind have occasionally come to our notice and the "victim" is hard to convince that he would have had different results with the

Connersville Valveless Rotary Pump

This high grade Pump has been used for Vacuum Heating since 1908 in modern hotel, office, store, factory and other buildings in every state and city.

Ask for Bulletin 12H.

THE CONNERSVILLE BLOWER COMPANY
CONNERSVILLE, INDIANA

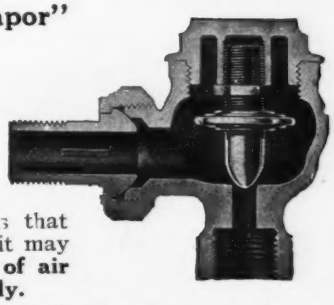
CHICAGO
929 Monadnock Block

NEW YORK
114 Liberty St.

Marsh Reflux Junior Thermostatic Traps

For Radiators and Coils of "Low Pressure," "Vapor" and "Vacuum Heating Systems".

Freely Discharges Air and Water Without Loss of Steam



THE Marsh REFLUX Return Line Trap is for use on the return end of radiators of low pressure, vapor and vacuum systems of heating. It is the result of a careful investigation into the actual requirements that must be fulfilled by a radiator return valve. in order that it may accomplish what is desired of it, namely, **to free the radiator of air and water without the loss of steam** and to do so **noiselessly.**

The Marsh Reflux Junior Thermostatic Trap is recommended for small radiators and coils. This Trap for the small and the Original Reflux for the large units will make an ideal job. Especially adaptable for two pipe gravity work and vapor systems.

May be furnished either concealed adjustment (as illustrated) or with outside adjustment. **Write for literature fully describing this trap.**

JAS. P. MARSH & CO., 118-124 South Clinton Street **Chicago**

Established 1865

Manufacturers of Gauges for all Pressures and Purposes. **Automatic Air Valves and Steam Specialties.**

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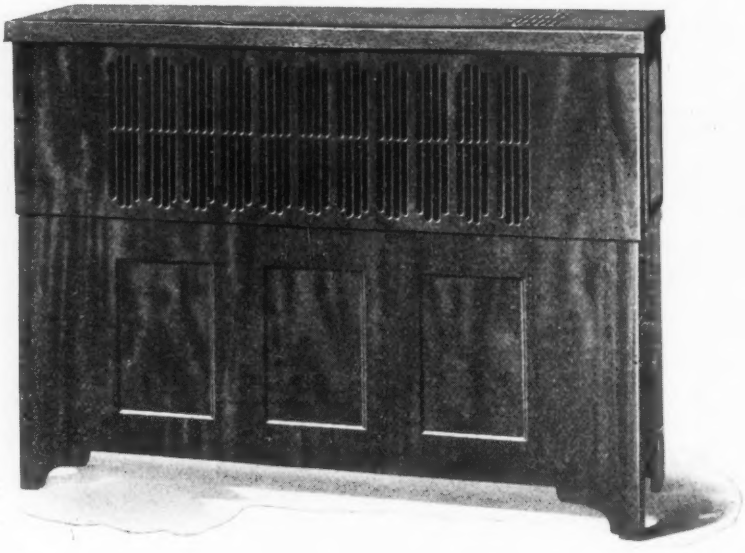
(An automatic heat control)



New business wherever there's a radiator

New business from residences, apartments, hotels, offices, etc., if you sell the Ja-Nar'—the trouble-free, automatic heat-control. Old and new customers will want the comfort of uniform heat without the bother of continually turning radiators on and off.

No expense to install or operate—no connections of any kind, no pipes, wires or compressor. The mechanism is self contained. The Ja-Nar' is simply placed over the radiator, covering it with a beautiful piece of furniture finished to match mahogany, light or dark oak, or in white or tinted enamel.

Your customers will want several Ja-Nar's after they have tried one. We guarantee satisfaction.

Learn about this new money maker. Send the coupon for catalogue C today.

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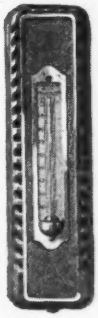
THE FULTON CO., New York, Knoxville or Chicago. You may send me Catalogue C.

Name and address .....

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*



Houghton American Thermostat

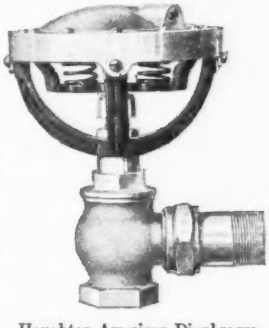
Heat Control for the Industries

IF you use heat in any process of manufacture, the Houghton American System will furnish positive, precise control.

Houghton American System of Heat Control

(PATENTED)

The Houghton American System regulates the temperature of radiators, coils, tanks, kiers, vats, kettles, dry rooms, ovens, kilns or any other heating or drying apparatus, whether the medium is steam, hot water or warm air.



Houghton American Diaphragm Radiator Valve

The Houghton American System guards against overheating and prevents spoiled material.

Its effect upon the physical welfare and industrial efficiency of indoor workers is too well known to require detailed description.

Let us talk over your Problems

SINCE 1865

E. F. HOUGHTON & CO.

Publishers of The HOUGHTON LINE

Third and Somerset Sts. Philadelphia

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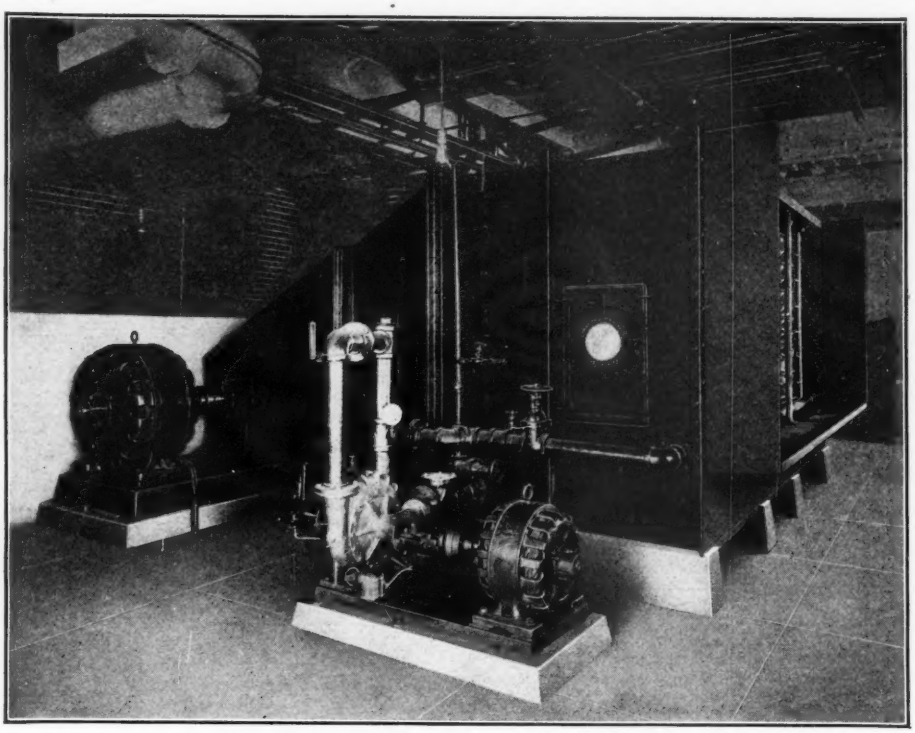

SPRACO
Air Coolers and Washers

At the Long Island City Power Station of the Pennsylvania Railroad a 21,000 kv-a., 11,000-volt turbo-generator has been supplied with clean, cool air from a Spraco Washer since January, 1915.

The capacity of this Spraco Washer is 60,000 cu. ft. of air per minute, and a drop in temperature of from 5 to 15 degrees F. is obtained. Even when operating for 23 hours a day the temperature of the windings never exceeds 86 degrees C., although they will stand 110 degrees C. without injury.

The 8,000 kw. turbo-generators in this plant are cleaned twice a year, while the Spraco-supplied unit has needed no cleaning since installation.

Why not improve the performance and reduce the maintenance of your generators by the installation of a Spraco equipment?

Send for Bulletin No. 250, just issued

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ENGINEERS MANUFACTURERS

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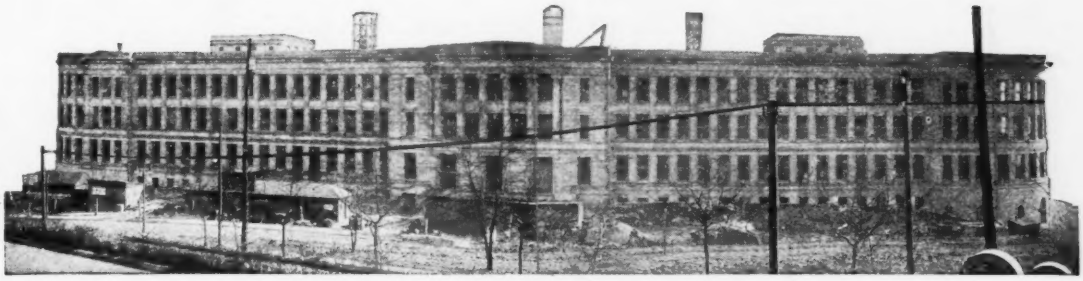
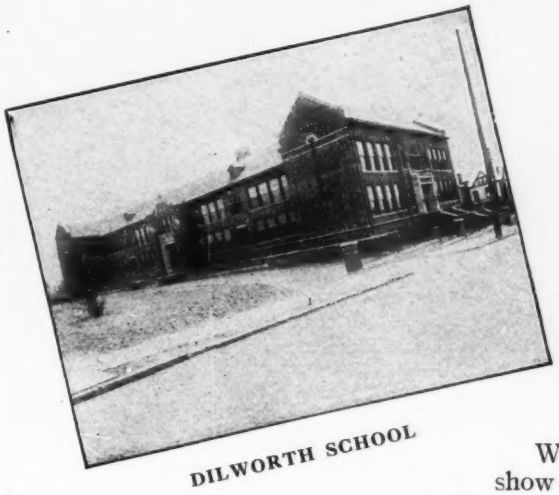


SCHENLEY SCHOOL



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McKELVEY SCHOOL

We
show here
five school buildings
in Pittsburgh which have been
equipped with our apparatus in the last year.
Whether it be **Niagara Conoidal Fans** or **Carrier Air Washers**
there is a size to suit every installation from largest to smallest,
and everyone will do its work quietly but effectively.

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BUFFALO FORGE CO.

OFFICES IN ALL
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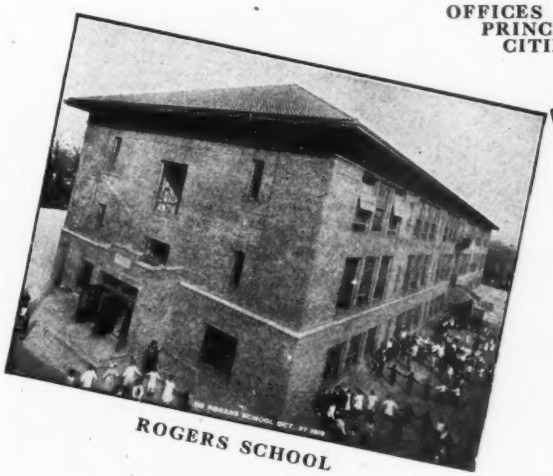

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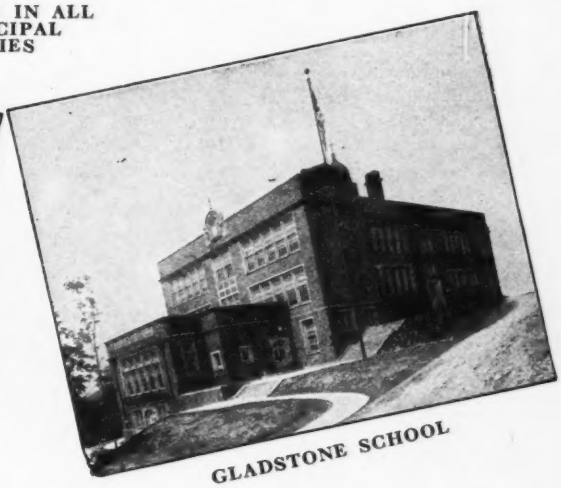


GLADSTONE SCHOOL

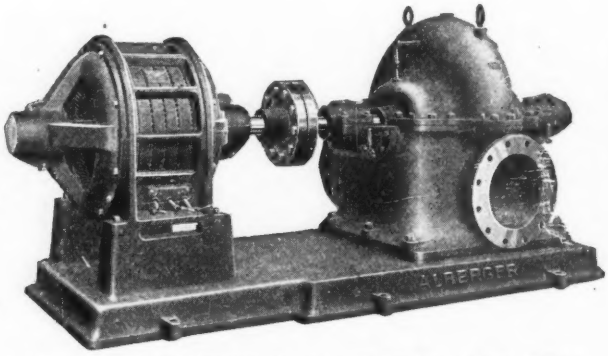
"WAINWRIGHT" HEAT TRANSMISSION APPARATUS

We offer the experience of our Engineering Department in solving Heat Transmission problems especially in connection with our apparatus for Forced Circulation Hot Water Heating for large installations.

Centrifugal Pumps

Steam Turbines

Condensing Equipments

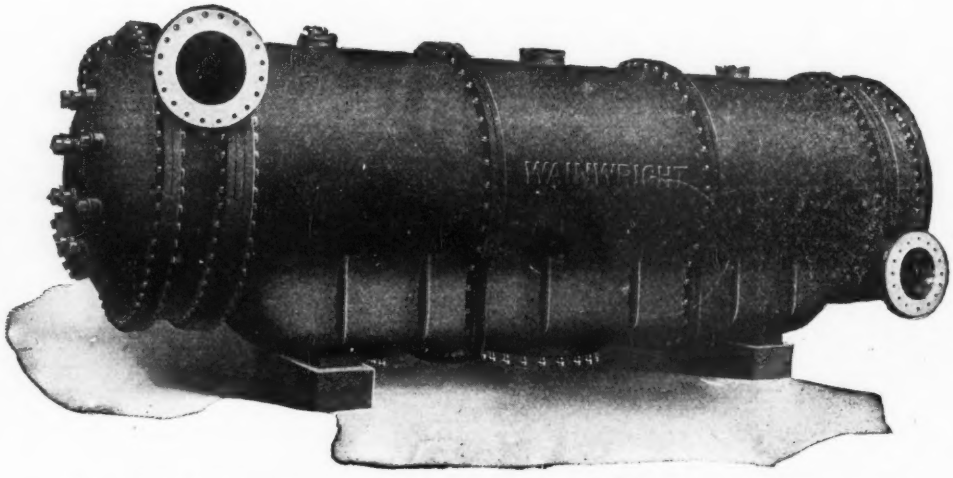


Surface Heaters

Water Meters

Expansion Joints

Motor Driven Alberger Type "C" Turbo-Volute Pump



Wainwright Heating System Heater, Containing 5500 Square Feet of Corrugated Copper Tubing and Furnished with Cast Steel Water Channels for High Water Pressure

ALBERGER PUMP AND CONDENSER CO.

140 CEDAR STREET, NEW YORK

Boston Pittsburgh Chicago St. Louis Philadelphia San Francisco

"NATIONAL" PROGRESS PIPE

NEARLY 90% AND STILL GOING UP!

¶ Progress is the order of the day—in the production of Pipe as well as in anything else.

¶ As an example: Steel Pipe was first made in 1887; The tonnage of about 300 tons was practically negligible.

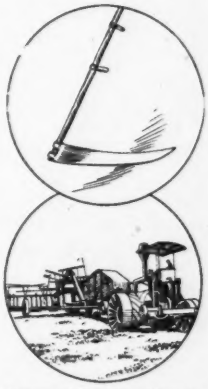
¶ Today, however, Steel Pipe represents almost 90% of the total tonnage of screw-joint pipe made in this country—and the progress made in the production of "NATIONAL" Pipe is leading the procession.

¶ The following figures, taken from the Special Statistical Bulletin No. 3 (1916) of the American Iron and Steel Institute, are eye-openers to the progress of Steel Pipe.

From the Candle to the Electric Light

PRODUCTION OF IRON AND STEEL SKELP IN THE UNITED STATES FROM 1905-1915 GROSS TONS

Year	Iron	Steel	Total	Per Cent. Iron	Per Cent. Steel
1905	452,797	983,198	1,435,995	31.5	68.5
1906	391,517	1,137,068	1,528,585	25.7	74.3
1907	444,536	1,358,091	1,802,627	24.6	75.4
1908	297,049	853,534	1,150,583	25.8	74.2
1909	370,151	1,663,230	2,033,381	18.2	81.8
1910	350,578	1,477,616	1,828,194	19.2	80.8
1911	322,397	1,658,276	1,980,673	16.3	83.7
1912	327,012	2,119,804	2,446,816	13.3	86.7
1913	312,746	2,189,218	2,501,964	12.5	87.5
1914	264,340	1,718,091	1,982,431	13.3	86.7
1915	262,198	2,037,266	2,299,464	11.4	88.6



From the Scythe to the Mowing Machine

¶ THEREFORE, it seems evident from these figures that Steel Pipe—"NATIONAL" Pipe—can legitimately lay claim to the title "THE MODERN PIPE", for it is distinctively a PRODUCT OF PROGRESS.

¶ **"The Rise of Steel Pipe"**—Send for a copy of "NATIONAL" Bulletin No. 24 if you are interested.

From the Old Roman Messenger to the Telephone

¶To readily identify "NATIONAL" material and as protection to manufacturer and consumer alike, the practice of National Tube Company is to roll in raised letters of good size on each few feet of every length of welded pipe the name "NATIONAL," except on the smaller butt-weld sizes, on which this is not mechanically feasible on these smaller butt-weld sizes the name "NATIONAL" appears on the metal tag attached to each bundle of pipe).

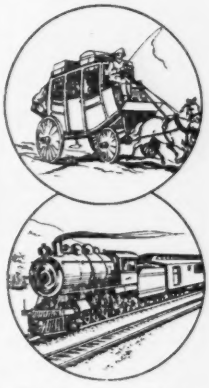
¶When writing specifications or ordering tubular goods, always specify "NATIONAL" pipe, and identify as indicated.

LOOK FOR THE MARK

Name Rolled in Raised Letters on National Tube Company Pipe

¶In addition, all sizes of "NATIONAL" welded pipe four in. and under are subjected to a roll-knobbling process known as Spellerizing, to lessen the tendency to corrosion, especially in the form of pitting. This Spellerizing process is peculiar to "NATIONAL" pipe, to which process National Tube Company has exclusive rights.

¶"NATIONAL" pipe was awarded the GRAND PRIZE (highest possible award) at Panama Pacific International Exposition, 1915.

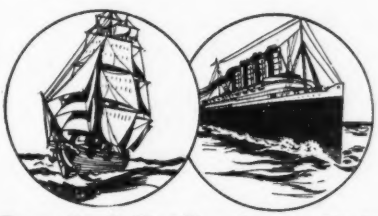


From the Stage Coach to the Modern Limited

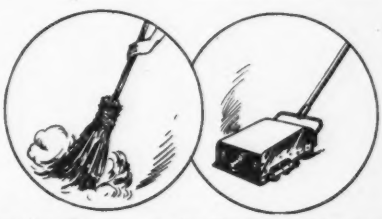
NATIONAL TUBE COMPANY

Pittsburgh, Pa.

District Sales Offices in the Larger Cities



From the Sailing Vessel to the Modern Liner



From the Broom to the Vacuum Cleaner

It pays to be NATIONALly Prepared

Automatic Temperature Control

: : FOR : :

Industrial Processes

High

Heat

High and Low Temperature Thermostats operated by Air, Water or Gas for the control of any Degree of Temperature in all Industrial Processes.

Damper Regulators for all types and sizes of Steam, Vapor and Hot Water Boilers

Temperature Regulators operated by Air, Water or Gas for all types of closed or open tanks

SUGGESTIONS

Enameling Ovens
Dry Kilns
Lead Kettles
Glue Pots
Peanut Roasters
Dryers
Meat Retorts
Pasteurizers

What Problem have you for our Engineering Department?

Pressure Regulators

Impervious to heat

TRADE METAPHRAM

Valves and Motors are a part of National equipment

Tank Regulators

Low

Refrigeration

National Regulator Co.

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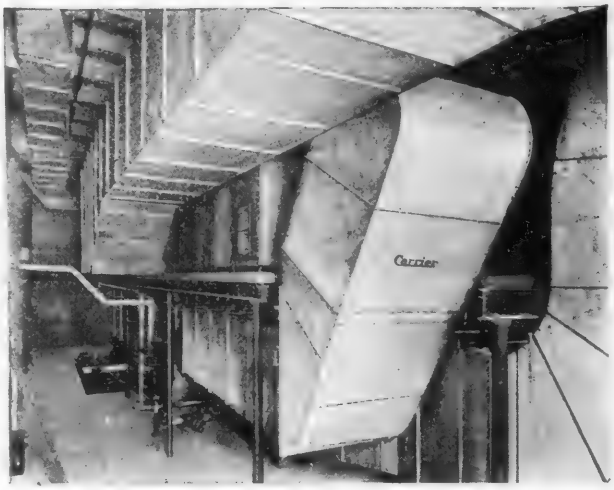
Offices in all Principal Cities

A CARRIER DEHUMIDIFIER INSTALLATION

Of Interest to Heating and Ventilating Engineers



Under maximum conditions, this installation in a prominent celluloid manufacturing plant, operates at about one hundred and ten tons capacity. Thirty-two tons is done by well water, which is procured at 56 degrees Fahr., thirty tons is done by the interchanger, and the remaining forty-eight tons by refrigeration. The artificially cooled water enters the dehumidifiers at 33 degrees Fahr. and the compressors run with a suction pressure varying from thirty-five to forty pounds.

The dew-point, or the temperature at which the air leaves the final dehumidifier, is automatically controlled by passing a portion of the water around coils and mixing it with water which has been cooled, thus procuring the proper temperature for the work required.

When much air must be heated after the moisture content has been reduced to the desired amount, a Carrier Interchanger added to the Dehumidifier will effect considerable economy of operation. The interchange of heat which it produces serves the double purpose of cooling the incoming air and heating the air which has been dehumidified.

Interchangers, and extremely accurate controlling devices, are among the refinements which we can often properly incorporate into Carrier Air Conditioning Apparatus to render the apparatus more profitable or accurate.

Our experience as pioneer air conditioning and heating and ventilating specialists enables us to give our clients much better satisfaction than by merely selling material. Ask for our literature, and if you want it, our free engineering advice.

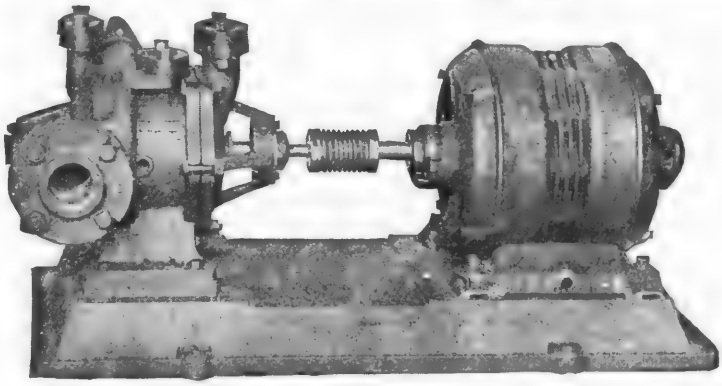
Carrier
AIR CONDITIONING AND DRYING EQUIPMENT

Carrier
Engineering Corporation

39 Cortlandt St., New York

Buffalo	Chicago	Boston	Philadelphia
Mutual Life Bldg.	Transportation Bldg.	176 Federal St.	Land Title Bldg.

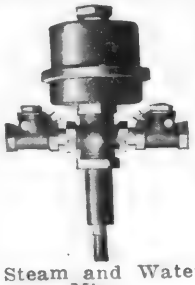
Nash Hydro Turbine Return Line Vacuum Pumps Require Only Half the Horse Power Usually Necessary



Size C, Capacity 19 cu. ft. air and 35 gallons of water per minute, delivered against 10″ of vacuum and 10 lbs. pressure, direct connected to 2 HP. motor.

Write for full information.

Nash Engineering Company, South Norwalk, Conn. U. S. A.

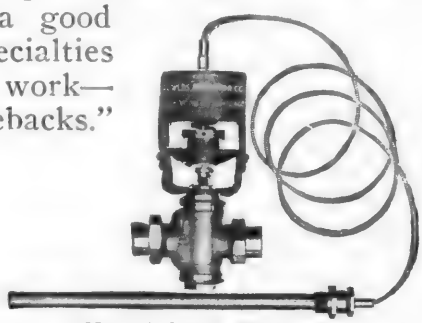


Steam and Water Mixer. Bulletin 137.

Make Your Specialty Sales Pay Your Overhead Expense

There is more profit in specialties than in contract work. There is extra good money in Powers specialties because they always work—and there are no "comebacks."

Hot Water Tank Regulators
Shower Bath Controllers
Steam and Water Mixers
Garbage Burner Regulators
Pressure Reducing Valves, etc., etc.



No. 11 Tank Regulator. Bulletin 129.

Send for Bulletins

The Powers Regulator Co.

New York
101 Park Avenue

Chicago
No. 5 South Wabash Ave.

The Heating and Ventilating Magazine

VOL. XIV. NO. 1

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Programme for Annual Meeting.
New York Chapter Advances Movement for Standard Boiler Testing Code.
Address on Form for Choosing Bidders and Awarding Contracts Presented Before Illinois Chapter.
Eastern Pennsylvania Chapter.

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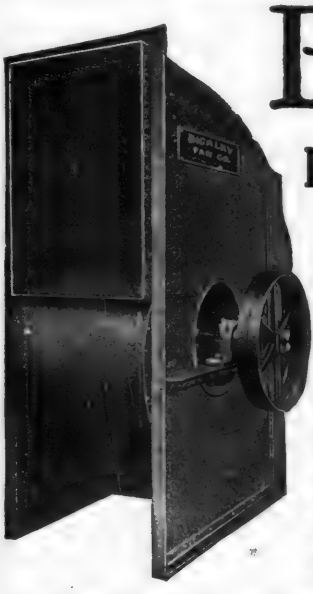

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THE HEATING AND VENTILATING MAGAZINE

Cooperstown, N. Y. JANUARY, 1917 1123 Broadway, New York

Air Conditioning Problems in the Manufacture of Ammunition

A Plant That Has Met Unusually Difficult Requirements.

By J. I. LYLE

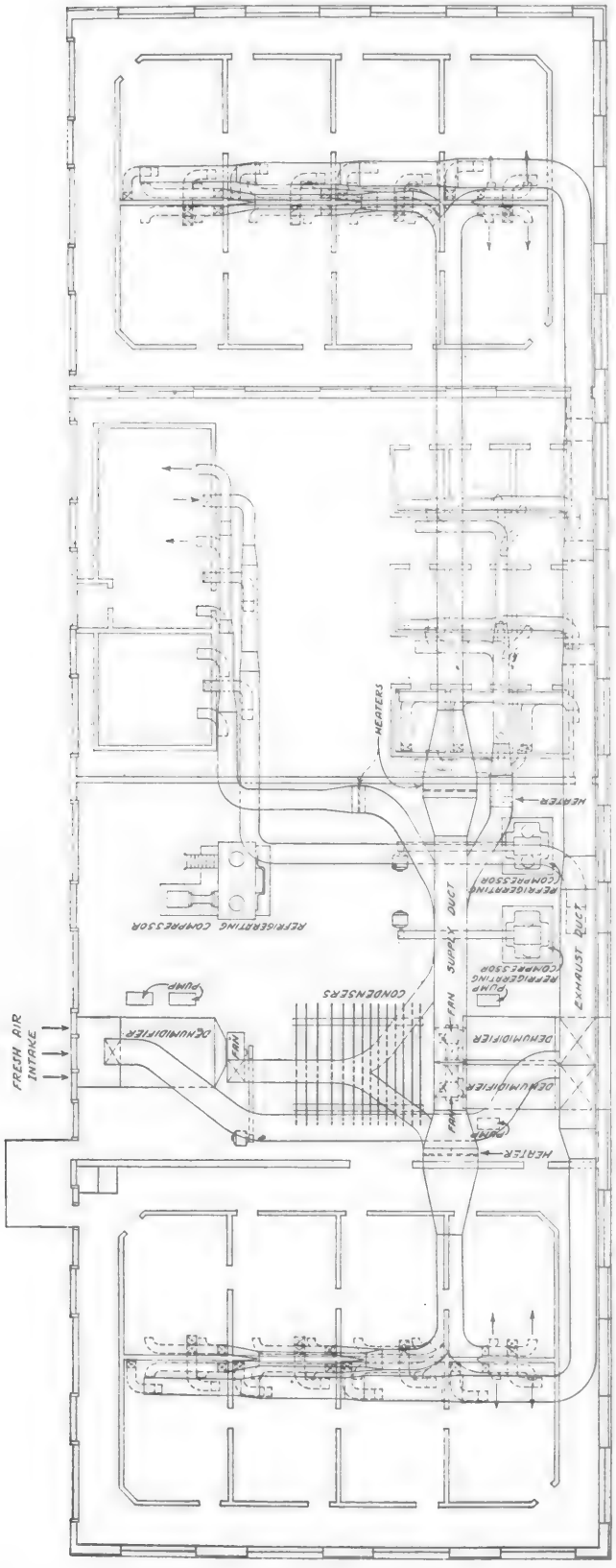
Time fuses for shrapnel shells must be capable of setting for explosion of the shell anywhere from within 16 ft. of the muzzle of the gun to a distance several miles away, while the shell is traveling at a velocity of 1,700 ft. per second, or about 20 miles per minute. Two shells set for exploding at one mile and fired consecutively should function within 40 ft. of each other.

The accuracy of firing is absolutely dependent upon conditioning the powder, and as the powder used in a time fuse is very hygroscopic, the humidity of the atmosphere in which the fuse is loaded must be maintained within a total variation of less than 2%.

Extremely accurate control of humidity and temperature is, therefore, one of the first essentials in a fuse-loading plant, and inasmuch as 24-hour per day plant operation is necessary and as later deliveries are generally penalized in this class of work, the air conditioning system, like all other apparatus, must be designed and installed with every precaution for uninterrupted operation.

The methods and apparatus by which satisfactory air conditions are being maintained by one of the prominent American munition makers are indicated by the accompanying floor plan and photographs. It will be noted that the actual loading operation is carried on in numerous small rooms housed inside of a larger building, an arrangement which shields the work from the rapid fluctuation of outside weather conditions that would otherwise tend to impair the accuracy of control. These rooms are provided with conditioned air from a Carrier system that maintains temperature uniformly at 70° F. and proper relative humidity at all times. Provision is also made in a number of experimental rooms for varying the air conditions over a wide range.

Reference to the layout shows two sets of ducts, one having an opening in each room for admission of correctly conditioned air and the other having similar outlets for carrying away the air as its temperature and humidity characteristics change. In other words, each room is merely an enlargement in the circulating system in which a complete change of air occurs every few minutes. This arrangement also provides ample ventilation for all operatives, keeping them able and ready to do efficient work, and at the same time carries away the small particles of powder that float into the air. These particles are moistened in the air conditioning apparatus and



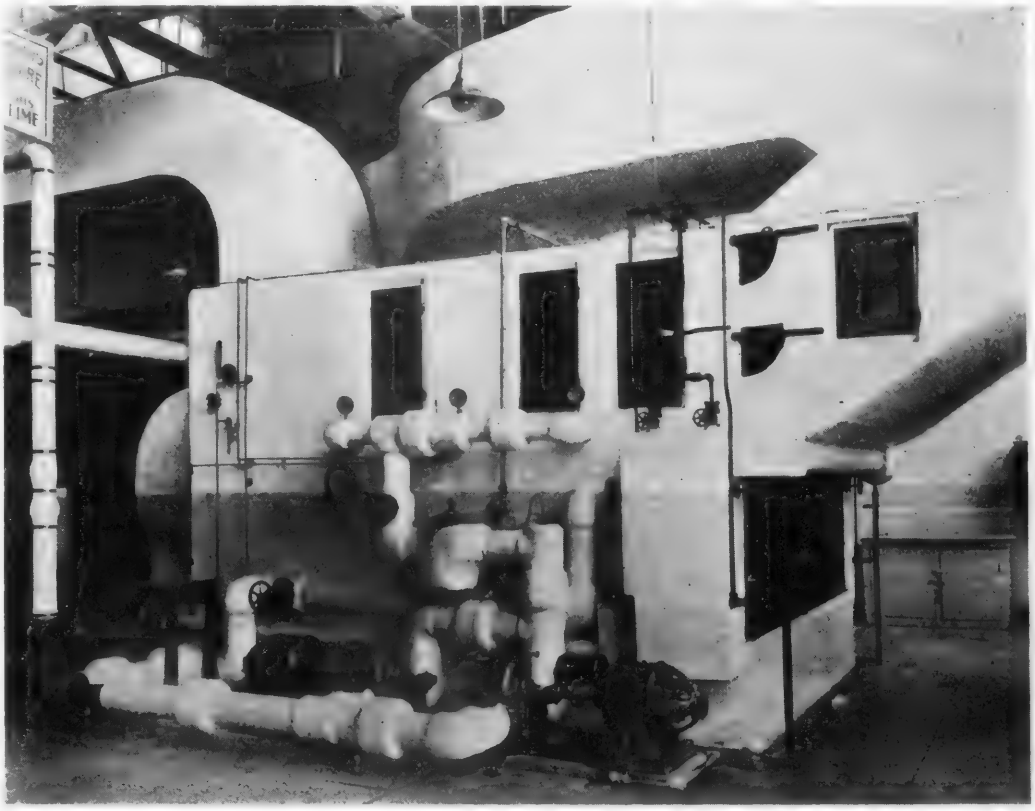
LAYOUT OF AMMUNITION PLANT, SHOWING LOCATION OF PARTS OF THE AIR CONDITIONING SYSTEM.

carried to the bottom of a settling tank from which they can be removed without doing any harm.

The air is circulated by a Conoidal type of centrifugal fan, discharging into galvanized iron ducts, but before it enters the fan and discharges through the distributing ducts in the building, it is first drawn through Carrier apparatus arranged to act sometimes as humidifiers and sometimes as dehumidifiers as the weather changes may demand in maintaining the uniform standard. The secured by using cold well water or refrigeration. In either instance, automatic regulation is provided to keep the dew point constant.

For reasons of economy of heat in winter and for refrigeration purposes in summer, the air is largely returned from the building, purified and recirculated, together with a small "makeup" from outside.

Dampers are provided in the fresh and return air inlets and are automatically regulated to take from each source the



ONE OF THE DEHUMIDIFIERS, SHOWING DUCTS, PIPE CONNECTIONS, INSULATION, INJECTOR HEATER AND WATER CIRCULATING PUMPS.
(Condensing Coils of the Refrigerating System at the Rear.)

air leaving this apparatus is saturated at a definite temperature and has a definite moisture content. This is accomplished by interposing fine sprays of water into the path of the air within a sealed chamber, the temperature of the water being regulated to produce the desired dew point. When the water must be heated to do this, steam is injected into the it on its way to the spray nozzles, and if a cooling effect is necessary this is proportionate amount of air to give the desired temperature. Additional dampers are provided in the fresh air inlet so this may be closed absolutely tight when no air is taken from the outside. Summer and winter humidity controls in each room make the regulation very accurate.

Vento heaters operating with steam and placed in the discharge ducts can be used, where necessary, to raise the tem-

perature in winter time to the desired degree.

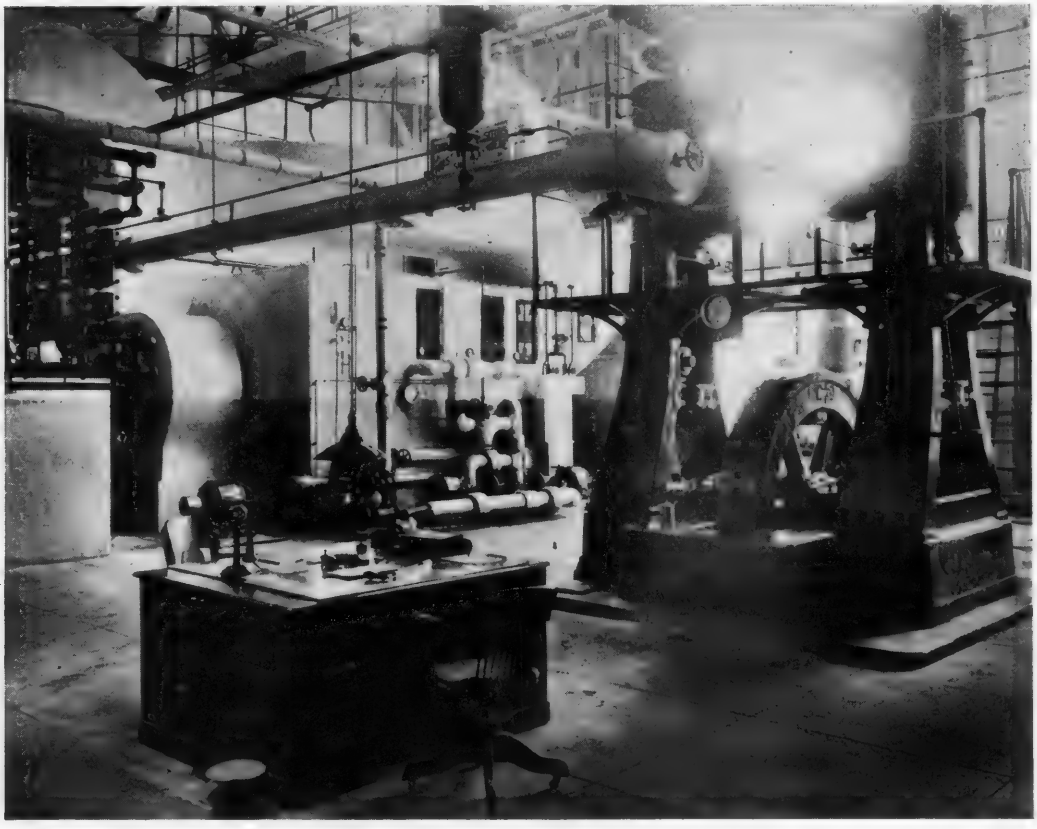
At times when the outside air contains too much humidity, especially in hot weather, the excess moisture is removed by the units acting as dehumidifiers. This is done by cooling the air as it passes through, to lower the dew point and condense the excess. The water used in the spray chambers in this instance is cooled by passing over sets of direct expansion Baudelot coils, located in a compartment below the spray chamber and which are operated only at times when needed.

The original installation consisted of two Carrier self-contained dehumidifiers equipped with summer and winter dew point control, and in which the Baudelot coils are located in separate chambers directly beneath the spray chambers, which in this instance are about 7 ft. wide, 15 ft. long and 10 ft. high. Each unit was provided with two pumps, cross-connected so that one was always held in reserve for emergency. Likewise the fan (belt-driven) of each unit was provided with two motors, one for regular duty and the other for emergency.

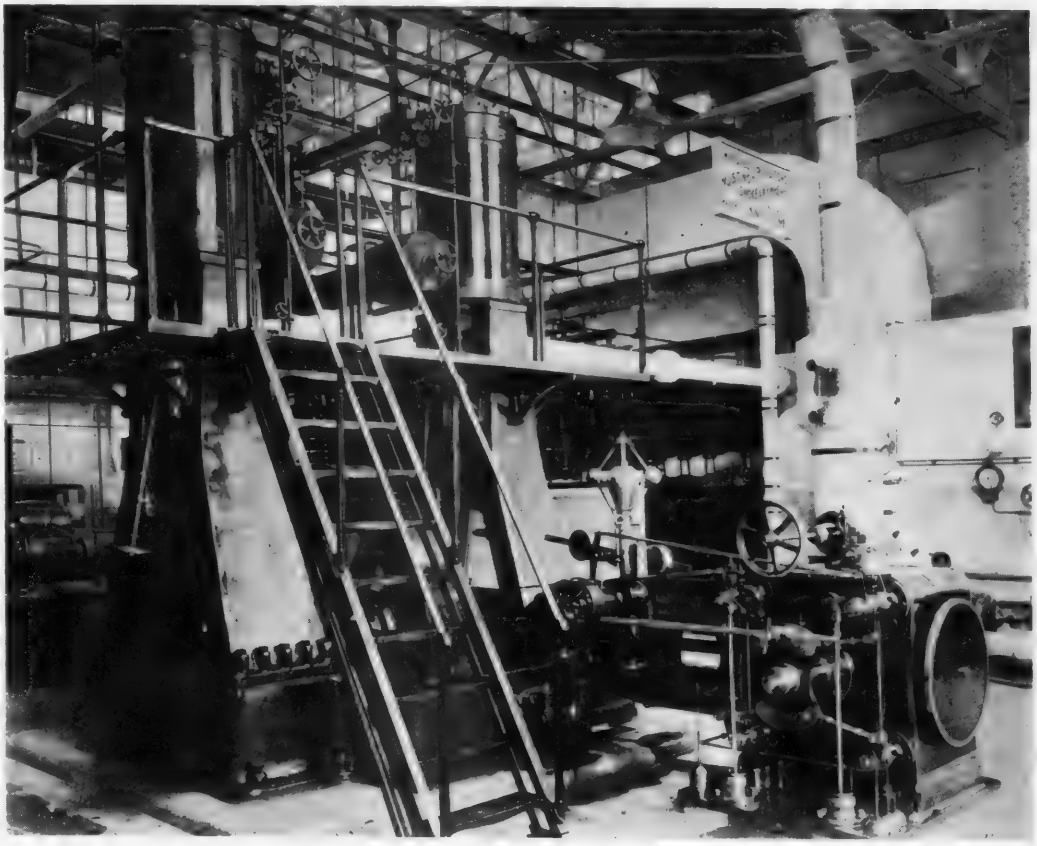
The body of each dehumidifier is insulated by a covering of cork board and Portland cement and all ducts are covered with Nonpareil cork board and an outer layer of canvas.

The refrigerating machinery consists of two vertical single-acting York ammonia compressors, belt-driven by 60 h.p. direct-current motors. These motors are designed for a wide speed variation by means of field control, which keeps the efficiency of the motor at a high point for all speeds. The condensers are of the double-pipe type so that they could be located within the apparatus room.

Subsequent to the original installation, increase in the size of the plant demanded additional air conditioning equipment. Another unit similar to the



ONE OF THE DEHUMIDIFIERS AND AMMONIA COMPRESSORS.
(Part of the Condensing Coils Shown at the Left.)



THE ENGINE-DRIVEN AMMONIA-COMPRESSOR AND CONDENSING COILS USED AS PART OF THE SECOND INSTALLATION.

first two, but slightly larger, was then added and connected to deliver into the system of ducts already installed.

The refrigerating machine, in this instance, however, consisted of a vertical single-acting ammonia compressor, direct connected to a horizontal Corliss engine.

The idea, as carried out in this plant, of installing extra capacity and duplicating all parts subject to accidental damage or break-down, so that continuous operation is always possible with little or no delay, has worked out very well, and proven well worth the added cost.

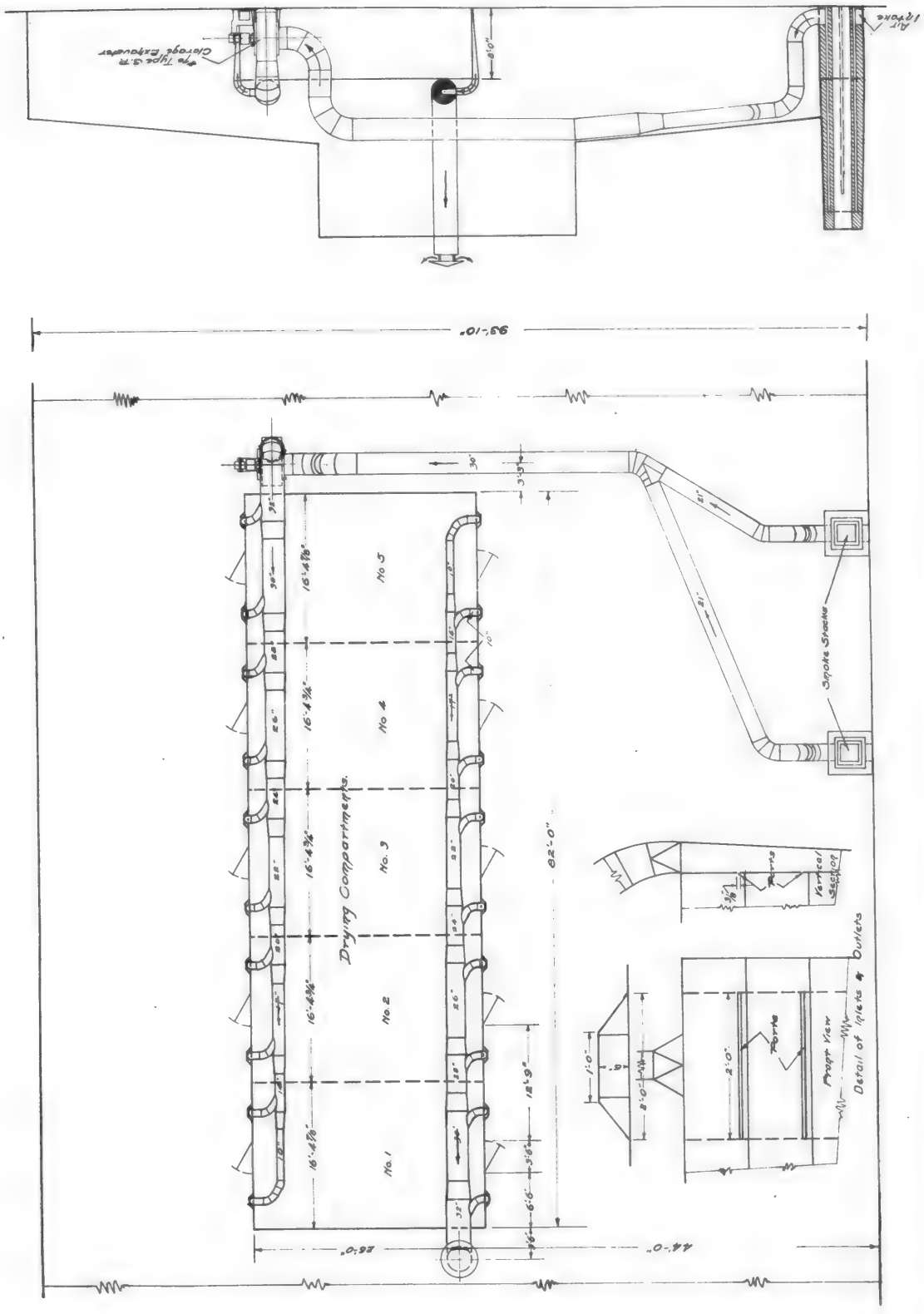
Accurate records which have been kept of humidities and temperatures indicate that the control has been as dependable as could be desired.

Utilizing Waste Heat for Drying Purposes

Obtaining steam or hot water by means of economizers is not a new thing in the field of engineering, but the utilization of waste heat from smoke stacks to obtain heated air for drying purposes or for ventilation is a recent and interesting development.

In the plant of the Detroit Stove Works—the largest manufacturers of stoves in the world—the air, passing through a chamber which surrounds the smoke flue and which is built in the stack, is heated to a temperature suitable for drying various kinds of material.

The source of heat is a bank of four


Drying Compartments
No. 1
No. 2
No. 3
No. 4
No. 5
Smoke Stacks
Detail of Inlets & Outlets
Front View
Vertical Section
Plan
82'-0"
93'-10"
44'-0"

enameling ovens connected to two square stacks. These stacks are built with wall especially thick in order to prevent radiation losses, and measure 5 ft. outside at the base and are 25 ft. in height. The smoke flue of the stack, 2 ft. square inside is surrounded by a 5-in. chamber extending from the bottom of stack to within 2 ft. of the top.

This chamber is divided into two parts by a baffle so that outside air, which enters at the bottom, travels up one side and down the other and is drawn out at the bottom into the piping system. During its travel the air passes over 176 sq. ft. of surface which radiates enough heat to raise the temperature of the incoming air from 20° F. to 152° F. From the volume of air handled and rise in temperature it was computed that the two stacks gave off 1,053,000 B.T.U. per hour. The same amount of heat, on the basis of like quantities of air and temperature rise would be obtained with five sections of pipe coil heater containing 820 lin. ft. of 1-in. pipe and operating under 30-lbs. steam pressure.

Pipes losses are sufficient to reduce the temperature to 140° F. in the dryer. This dryer, 82 ft. long, 26 ft. wide and 8 ft. high, is divided into five compartments. At opposite ends of each compartment are 16 inlets and 16 outlets. These distribute the air evenly over pipe racks upon which the enameled steel sheets are placed for drying. Since the enamel holds approximately 4 lbs. of moisture per 100 sq. ft. of surface, it is necessary to thoroughly dry the sheets before placing them in the intense heat of the enameling ovens. This drying process gives the enamel a smooth finish. Changing the air every 2½ minutes in each compartment, the material dries in 15 minutes.

The air is forced through the system by means of a No. 70 Clarage type S. P. exhaust fan. This fan delivers 6,750 cu. ft. of air per minute against 3 in. static pressure, when running at 550 R.P.M. Under these conditions, it requires 5.5 brake horse-power to drive.

The engineering department of the Clarage Fan Company, Kalamazoo, Mich., designed the entire system of dryers, piping system, etc., while the actual installation was made by the Detroit Stove Works.

Returning Condensation to the Boiler

Several Methods That Are Particularly Suitable for Industrial Buildings.

By HAROLD L. ALT

Getting steam to a radiator is often only half the story and sometimes the smaller half. Especially is this so in industrial heating, where long runs of return pipes are the rule and high steam pressures the only source of steam supply for the heating system. There are four general conditions under which the returns will trouble the heating engineer and these may be classified as follows:

1. Where a high pressure boiler is used to supply steam to the heating system through a reducing valve.

2. Where the size of the job, length of runs, etc., make a gravity system impractical.

3. Where radiators are below the level of the boiler water line or of the return line to which they must be connected.

4. Where the initial cost and maintenance of the required extraordinary length of return pipe is not offset by a sufficient saving in the water returned and heat saved.

Almost all heating return difficulties come under one, or a combination, of the above heads.

When returns cannot be made to reenter the boiler by a plain gravity action the most common expedient employed is the ever-useful steam trap. Yet in spite of its frequent use little real knowledge is found among its employers as to its capacities, service and length of life.

One reason for this, undoubtedly, is the vast variety of traps which have been invented from time to time and the gen-

erous assortment in common and every-day use. In general, however, traps may be classified in two ways; either by the service they perform or by the method employed for their operation.

CLASSIFICATION OF TRAPS.

On the service basis there are four large general divisions, these being *return traps* (which return condensation back and into the boiler if located at a higher point) *free discharge traps* (which will discharge condensation into some receptacle where the pressure is less than trap pressure—usually against atmospheric pressure only) *lift traps* (which raise the condensation water by means of high pressure steam applied to the trap periodically) and special traps for vacuum apparatus, etc.

Classified according to construction and operation there are pot or bucket traps, float traps, thermostatic traps, differential traps, tilting traps and other special designs.

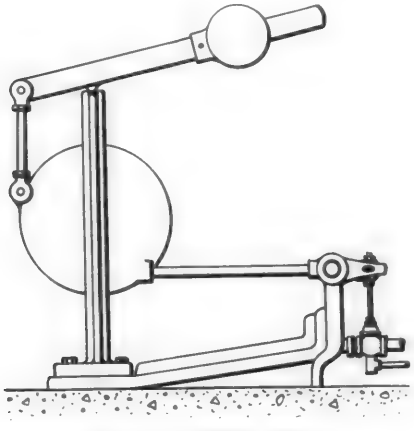


FIG. 1.—BUNDY TRAP.

It is not within the scope of this article to delve into the construction or operating principles of the various traps, it being intended only to discuss their proper utilization. Their standard sizes and various characteristics are briefly noted below:

STYLE "A." Common *separating, drip, non-return* or *tank* traps which discharge into atmosphere, or open receptacle such as a hot well, heater or tank but never back into the boiler. Such traps will also *raise* the discharge water against atmospheric pressure a distance of *two feet* for every *pound of steam pressure* on the line which they drain. They may be used on any inlet pressure up to 140 lbs. and are usually made in sizes ⅜ to 3 in. Similar traps for pressures up to 250 lbs. are obtainable in some makes in sizes from ⅜ to 1¼ in.

Such traps have only two connections, an inlet through which the condensation and steam enter the trap and the outlet through which the condensation is blown out into the pipe leading to the point of discharge. Whenever the point of discharge is higher than the trap the delivery efficiency will decrease 1 lb. for every 27 in. of lift.

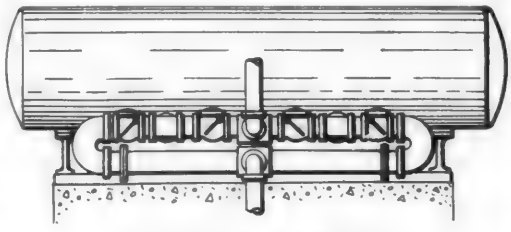


FIG. 2.—FARNSWORTH TRAP.

This type of trap has no vent.

STYLE "B." The common *"return"* or *"direct return"* trap is a term designating a trap *returning* the water of condensation to the boiler from a system operating at a lower pressure. This is accomplished by setting the trap a distance of at least three (or, preferredly, four) feet above the water line and then automatically applying the high steam pressure to the trap wherever it fills with water. The resulting steam pressure above the water in the trap, counterbalancing the steam pressure below the water (in the pipe leading to the boiler), the water sinks down by its own weight into the boiler. As soon as the trap is emptied the high pressure steam is cut off, a vent opened to relieve the pressure and the trap chamber is again ready for refilling at the lower pressure.

These traps have four connections, the inlet for condensation, the outlet for condensation, the high pressure steam inlet, and the vent pipe for the relief of the pressure after discharging. The vent pipe is usually connected into the ash pit.

This trap will also lift its discharge to any height within the limits of the high pressure steam applied and is usually made in sizes ¾ in. to 4 in.

STYLE "C." The *lift, three valve* (or *pumping* trap, as it is sometimes called) is the same trap as described for the return trap with similar connections. This trap will not return water to the boiler owing to the fact that the head of water due to the lift prevents a counter-balancing of steam pressure so that a lift trap is to a great extent only a farther development of the trap described in Style "A." For instance if a tank trap did not have sufficient pressure on the inlet to raise its discharge up to the desired point a lift trap could be substituted and, with its higher steam pressure connection, would undoubtedly do the trick.

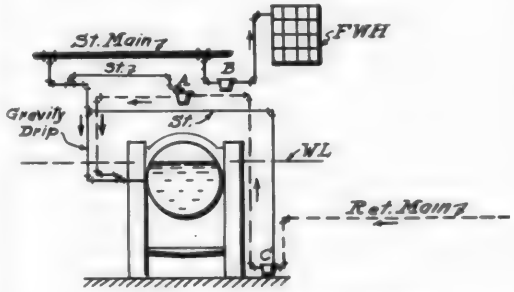


FIG. 3.—THREE USES FOR TRAPS.

Again a return trap set 4 ft. above the water line of the boilers might be so far above the lowest point of a heating system that a return trap—Style "B" would not have a sufficient lift capacity to force the water up to the desired level. In such a case the lift trap (probably combined with a receiver) would be substituted. The sizes, connections, and other details are the same as described for Style "B." The most successful types of lift traps are known as tilting traps—that is those which fill and tilt to operate. Two types of such traps are shown in Figs. 1 and 2.

As an illustration of typical uses of the three kinds of traps Fig. 3 is given in which a Style "B" trap returns the water of condensation to the boiler after the condensation has been lifted into it by the Style "C" lift trap which is below the boiler water line WL. Another portion of the steam main is dripped through a Style "A" trap which discharges into the feed water heater FWH.

In some cases one trap will do the whole work while in other cases two must be employed. Thus, if the return from a low pressure heating system can be brought back to the high pressure boilers at a point say four feet above the water line it can be returned direct to the boilers by a Style "B" direct return trap located at this point. On the other hand if the return line were at floor level of the boiler room then a second trap is needed to lift the return up into the direct return trap. This second trap may be an ordinary Style "A" tank trap—which will lift its discharge water approximately 2 ft. for every pound gauge pressure at the inlet—provided that the pressure in pounds on the return line at the lower trap is not less than one-half the vertical distance in feet between the two traps.

If the lift is too much for the pressure to be carried in the heating system

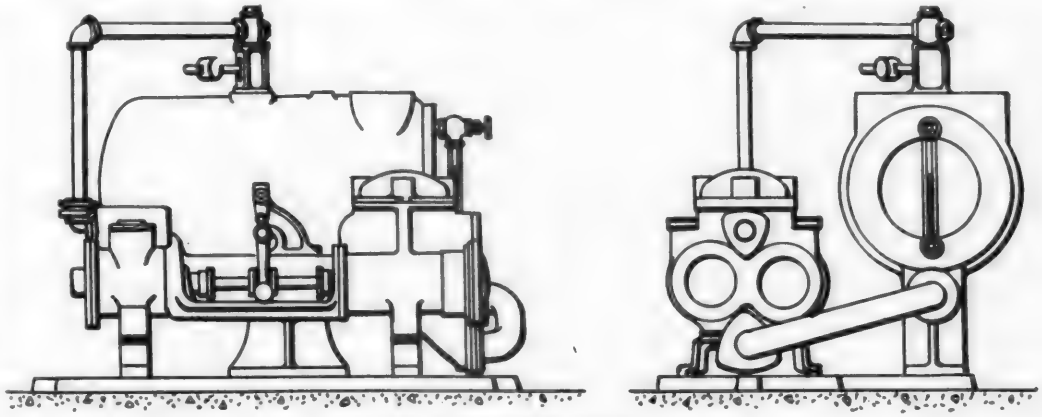


FIG. 4.—RECEIVER PUMP.

(and therefore the one which would have to be used for a style "A" trap) then the Style "C" lift trap operated by high pressure steam must be used. It makes no difference if the condensation is discharged into a feed water heater or open tank instead of being raised into a direct return trap the same requirements prevail as to the use of a tank or a lift trap. When several returns are to be cared for by one trap a receiver is recommended, this receiver being set a little higher than the lower trap. If the receiver is *vented* a Style "C" *lift* trap must be used because there will then be no pressure to operate a style "A" tank trap.

In cases where large quantities of condensation are produced at concentrated points (such as fan rooms) and also when the return line has to be run with numerous changes in elevation a receiver pump similar to that shown in Fig. 4 is employed to pump back the returns especially where these are of considerable magnitude.

Where receiver pumps are used they may be motor-driven, but are usually plain piston steam pumps with the exhaust discharged through an oil separator into the heating steam main. When so treated the cost of operation is practically nothing, but the expense of carrying a high pressure steam line to the pump location and the heat losses therefrom may be so great as to make an electric drive desirable.

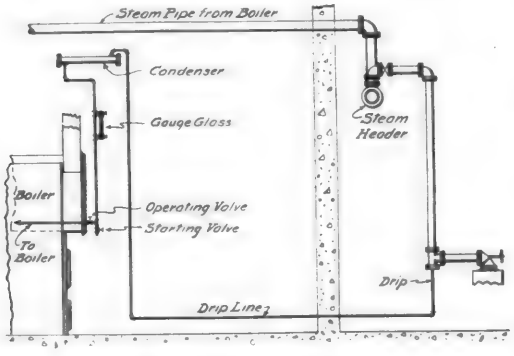


FIG. 5.—STEAM LOOP.

Receivers may be closed, or vented, as governed by the conditions under which they are installed. For instance if the receiver serves only one steam system all of which operates on the same pressure (so that the returns are also all at practically the same pressure) a closed receiver may be used with a balance pipe from the steam line connected to the top so as to equalize the pressure in the receiver. The several returns connected to such a receiver should either be run into it separately or should be effectually water-sealed by connecting to a main return line located well below the water line of the receiver.

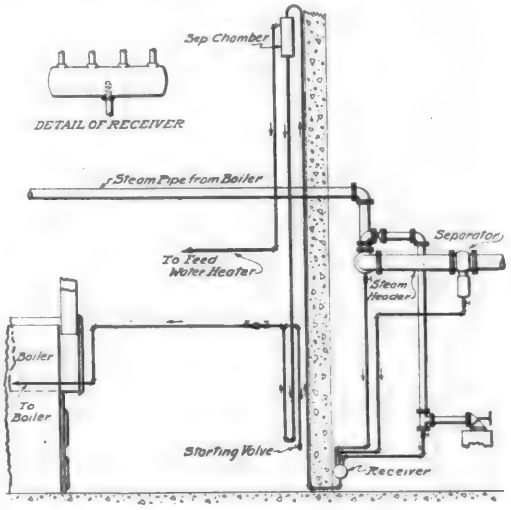


FIG. 6.—HOLLY SYSTEM.

On the other hand if the receiver is to take care of the condensation from several different pressures (such as laundry apparatus, cooking equipment, hot water heaters, and heating systems) each return must be separately trapped, the traps discharged to the receiver and the receiver vented to the atmosphere to prevent the accumulation of pressure due to the higher pressure trap discharges.

PROVISIONS WHEN VACUUM HEATING SYSTEMS ARE USED.

When heating systems get too large (as they often do in industrial work) to operate satisfactorily with a gravity two-pipe system, vacuum heating is almost invariably adopted. Contrary to the idea held by some vacuum heating does not mean a vacuum carried on the steam lines but, on the contrary, it does demand that a vacuum be carried on the return lines. In such systems the air

and condensation pass out of the radiators through a trap of the thermostatic or water-seal type being drawn through the trap (whenever it is open) by the vacuum maintained in the return line.

This vacuum is produced by a vacuum pump (which handles both air and water) taking its suction from the line and controlled so as to maintain any desired degree of vacuum and it not only serves to draw the condensation back to the pump along a return pipe run with a gradual slope toward the pump but will also pull the returns up hill to a limited extent. This is done by making use of a lift fitting and the lift, in low vacuum systems, is usually limited to four feet or so; on systems when a higher vacuum is used the lifts may be made

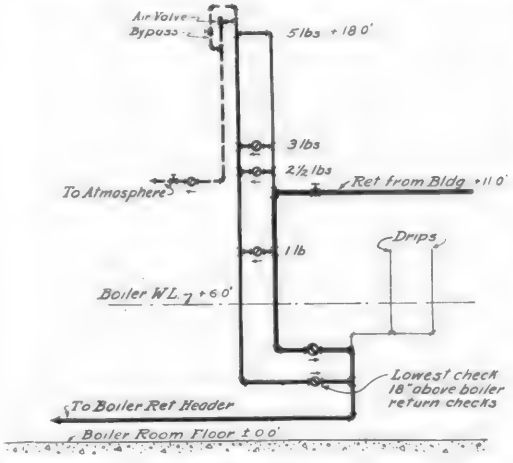


FIG. 7.—MODIFIED STEAM LOOP.

much larger the writer knowing of a case where a 15-ft. raise was accomplished but such high lifts should be avoided. The vacuum pumps discharge the air and water to an air separating tank from which the water enters the feed water heater.

High pressure drips are often returned by means of the steam loop which consists of an arrangement of piping such as is shown in the typical case illustrated in Fig. 5. The prime mover of the loop is the condenser, the operation being as follows:

The condensation settles down in the bottom of the loop and is then drawn up into the condenser by the gradual condensing of the steam entrapped between the condenser and the water in the bottom of the loop. The water drops into the condenser and then flows by gravity from that elevation down into the boiler. It can readily be seen that the height at which the condenser must be set is such that the head of water between the condenser and the boiler water line will develop sufficient pressure to overcome the pressure drop in the steam line, the pipe friction of the loop and the resistance of all the check valves. To start the system the starting valve is opened until all the air is blown out and steam appears at which time it is shut off and the valve going to the boiler is opened. The loop will then continue to operate automatically.

Where several drips are to be cared for and where they are liable to be under slightly different pressures owing to variations in pressure in the different portions of the steam line, a Holly system is used. This is illustrated in Fig. 6 and is not essentially different from the loop except that a receiver is used into which all the drips are connected. Out of the bottom of this receiver a perforated pipe is taken and carried up to a point high enough above the boilers to produce the desired head on the water pulled over the loop.

The motive force in this system, however, is not caused by the condensation in the condenser but instead a pipe is taken from the elevated chamber and connected into the feed water heater. A slight flow of steam through this pipe controlled by a throttle valve will cause the water collecting in the bottom of the receiver to be carried up over the loop and from this point it will fall into the boiler by its own weight, similar to the action in the simple loop.

VARIATION OF LOOP IDEA.

A rather original variation of the loop idea is used in some of this New York schools where the vacuum systems are operated by gravity during periods outside of the regular sessions. Owing to the vacuum traps on the radiator returns the creation of any pressure in the boilers will back the returns up in the return main similar to the action secured in a modulation system and to avoid flooding the return main the loop shown

in Fig. 7 is used. The condensing steam in the return line creates a vacuum in the return side of the loop and the pressure in the boiler holds the water up in the boiler side of the loop. As soon as the vacuum in the top of loop is sufficient the returns are drawn up and pass across through the checks into the boiler side. Here, as before in the simple steam loop, the hydrostatic head accumulates until the water passes down through the lower checks and into the boiler.

This accomplishes only what other standard devices will do automatically but as a study in loop returns it is most interesting.

Where the return lines are too long to pay to return the water of condensation a modulation system may be used with the returns drained to a sewer or a gravity system may be used with all the returns carried to a single trap which also discharges into the sewer. Of course, under these conditions both the heat of the returns and the water are lost.

Unusual Heating Demands for a Moving Picture Film Building

By GEORGE T. MOTT

The science of heat application, unlike that of electricity, is seldom spectacular, and for that reason we frequently hear the statement made that no progress is being made in the science of heating.

That this is far from the truth is evidenced by superficial observation, which will show that heating methods have advanced in practically the same ratio that building developments have demanded, not only in application, but in efficiency.

This advancement is particularly notable in the equipping of the industrial plant,—a growth which was made necessary by the great changes which have taken place in the industrial building, as well as the increased cost of anthracite fuel, and the constantly growing demand for a lessened overhead. The several factors of overhead as applied to heating, embrace not only interest on investment, depreciation and insurance, but also space conditions, and, in many instances also, a lighting factor. The modern plant with its extended glass area provides but little space for direct heating surface, and in consequence this surface to be adaptable must be sufficiently compact to avoid overlapping the glass areas. It is required also that it be relatively indestructible, to have a negligible depreciation, to be easily erected and capable of rearrangement with equal ease, to be sanitary and to be also capable of installation at a cost not in excess of previous practice. To accomplish this latter end, it must have a high transmission value and an absolutely dependable rating.

Having met these requirements, it is still necessary that the generating plant be placed on an equally efficient base, and here the terms of efficiency change somewhat and include not only investment, stability, space conditions, ease of handling in shipment and erection and a certified rating, but demands also a maximum thermal delivery to the plant from a low-cost fuel as delivered to the premises, and this with maximum labor and attention. These requirements, under existing conditions, eliminate anthracite fuel and substitute automatically the bituminous coals, which, particularly for

PLANT OF THE CENTAUR FILM CO., ON THE BAY FRONT, AT BAYONNE, N. J.

the Eastern territories, are relatively low in cost and uniformly high in thermal value. Incidentally, in the era of economy about to take place, these conditions will be accentuated.

That these rigid requirements have finally been met, is attested to by many plants all over the country. The illustrations given, departing as they do in a measure from the usual, approach the spectacular—and include the features of adaptability, compactness in a plant which demands this feature in excess, and above all a combination of maximum efficiencies.

STUDIO ON UPPER FLOOR OF CENTAUR FILM COMPANY'S PLANT.

Perhaps there are few better examples of application and efficiency of wall radiation than is evidenced in these illustrations, nor a more striking example of bituminous fuel consumption in a manner which adds to efficiency and complete smokeless consumption.

The plant in question, known as the Centaur Film Company, was erected by William Horsley, formerly manager of the Bigelow Boiler Works at New Haven for many years, and a "dyed in the wool" boiler man. Mr. Horsley, in the exercise of his expert boiler experience, endorsed for this plant, besides Rococo wall radiation, two No. 4128-S Ideal smokeless down-draft boilers for soft coal consumption, these boilers having a rating of 6,000 sq. ft. each in terms of column-type radiation. The total load on the plant is approximately 7,200 sq. ft., also in terms of column radiation, and this is uniformly carried by one boiler, the second boiler being used when the Vento surface, used in connection with the dry rooms, is thrown into action, or in excessively cold weather.

This plant has been in continuous operation since October, 1913, and the smokeless operation of the boilers is clearly observed by the clarity of the glass as shown in the roof, which glass incidentally has not been cleaned since the plant was put into commission. It will be observed that the stack projects

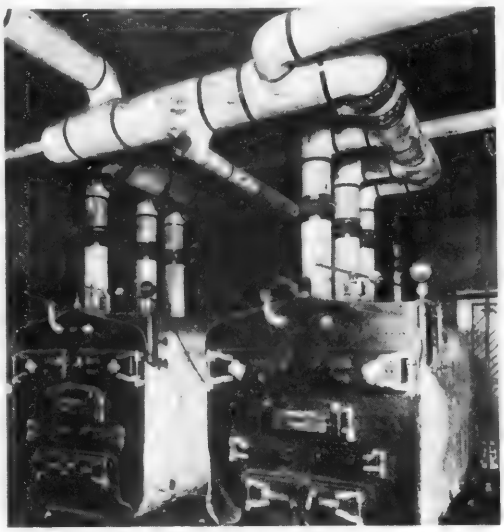
PART OF INTERMEDIATE FLOOR CENTAUR FILM CO., DEVOTED TO PROCESS WORK.

but slightly above the peak of the glass roof. This glass roof incidentally opens along its entire length on two sides.

The process of film development is particularly susceptible to damage, and the slightest particle of dust or grit from a stack deposited on a film would mean its complete destruction, in consequence of which it was required that ironclad guarantees be given covering the operation smokelessly, and with a complete absence of dust or cinders. The operation of the plant under these conditions has been continuous throughout the winter periods without protest. Incidentally, the plant has been subject to the variable fuels obtainable in the Bayonne industrial center, and has up to date comprised almost every type of low cost soft coal brought into the Eastern market. It is regrettable that we are unable to give the exact amount of fuel used in connection with the heating plant, but the intermittent service of the fan-drying system makes it difficult to separate the two services.

The building, as its name implies, is devoted to studio and film development work, and as such it is required that no part of the building at any time, regardless of external temperature, be below 70° F.—the upper floor in particular being kept at the tropical temperature of 80°. The Vento hot blast surface is applied only to the operation of film drying, this equipment being located in the basement and being operated intermittently. The building includes a total of approximately 300,000 cu. ft. and there is provided a total of 6,000 sq. ft. of wall radiation. The plant was installed by Diehl & Gross, under what is known as the Positive air return line system—a form of modified vapor installation which comprises but two air valves on the entire equipment. The plant throughout has the full and complete endorsement of President David Horsley, of the Centaur Film Company.

The illustrations shown give respectively the exterior, the upper floor which is devoted to studio work, and the intermediate floor which is devoted to process, the basement being devoted to development and drying. There is also shown an illustration of the boiler room which, however, is more or less incomplete, as the boilers at the time had not been completely covered.



BOILERS AND CONNECTIONS, PLANT OF CENTAUR FILM CO.

The building is of concrete construction throughout on a slight steel structure, and is situated in a highly exposed position immediately on the bay front at Bayonne, N. J.

Further Experiments in Electrical Heating

Data Gathered from Eight Installations in Seattle (Wash.) Residences.

For about four years the lighting department of the city of Seattle, Wash., has been investigating electric heating for the home to see just what could be done to make this form of heat cheap enough for general use.*

In the recently-issued biennial report of the Seattle Lighting Department, of which J. D. Ross is superintendent, an account is given of progress of the investigation since 1913.

Since the electric heater, states the report, of whatever type, transforms all the energy supplied to it into heat, there is nothing to be gained by attempting to raise the efficiency of the heaters themselves. The problem is to generate and distribute current at a lower price than ever before, and then to utilize the heat so that the least amount will bring the desired result, which is the maintenance of a comfortable temperature with ample ventilation in the home.

The first side of the problem, that of reducing the cost of current, may be solved in Seattle, at least in part, by the development on a large scale of the water power which is so abundant in this section of the country, and by the distribution of this power for heating by special heating circuits of higher voltage than the lighting circuits and without the expensive voltage regulators used on the lighting circuits.

DATA GATHERED FROM EIGHT INSTALLATIONS.

The other phase of the problem, the most economical use of the heat, has been very clearly defined by the experiments carried on by the department during the past four years. Data have been gathered from eight different homes equipped by the department for using electric heat in every way that appeared advantageous, both as an auxiliary and as the sole method of heating.

The first installation, at 1119 Grand Avenue, was in small five-room cottage, and consisted of open-air resistance heaters. No restriction was placed on the time or amount of current used, and the bills were paid by the owner so that the tenant was free to use as much current as he chose. Record of current was kept by recording meter, and temperature (average, maximum and minimum), were recorded every day for one year. These records are in the department files.

The consumption of current for the year was 12,360 kilowatt hours, and the maximum was 6,100 watts. Good ventilation was maintained, and the average inside temperature was kept at 68° to 70° F. The recording meter showed that the most current was used between 6:30 and 8:00 a. m. and 9:00 to 10:00 p. m., with a considerable amount between 5:00 and 9:00 p. m.

The heaviest demand, then, comes at almost the same time as the lighting peak. In order to make electric heating load an off-peak load, some heat storage is necessary. Electric heaters adapt themselves to hot water, steam, hot air or direct heating or to any combination of methods.

At 802 Thirty-third Avenue an electric water heater was installed to work in conjunction with the boiler of the hot water heating system. In the coldest weather both electric and coal heaters were used; in mild weather the electric coil alone was used, and very often the coal heater alone was used. This arrangement gave excellent satisfaction in heating the house, and the two heaters worked together without trouble.

Another method of using electric heat as an auxiliary was tried at 516 Thirtieth Avenue South. The house had a hot water heating system. The radiators in the rooms most used were equipped with individual electric heaters placed in the basement directly under them. Each heater was connected so as to permit the water in its radiator to circulate through it, and at the same time the circulation from the coal-fired boiler was not interfered with. No valves of any kind were

* A description of the original equipment, together with a report of the tests as made up to that time were published in THE HEATING AND VENTILATING MAGAZINE for January and March, 1915.

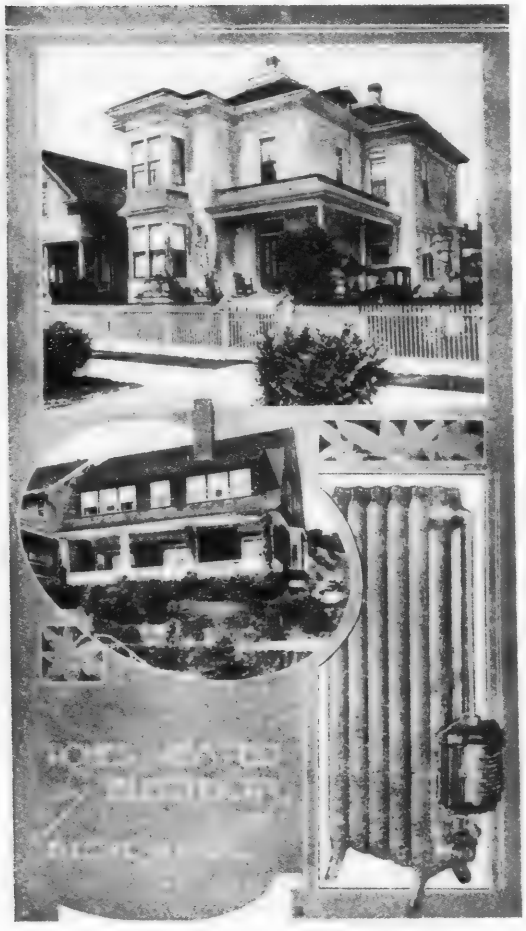


FIG. 1.

used. This arrangement is shown in the accompanying illustration. The hot water system can be operated entirely by electric current or by coal as desired, or only enough coal may be used to keep the entire house at about 60° F., and each electric heater may be used to bring its room to the temperature desired.

The first heaters used here were simply coils wound around a section of the pipe, using the pipe for a short-circuited secondary and getting the heating effect from the hysteresis and eddy currents in the iron pipe. These heaters were inferior to the resistance type used later on the same system in that their power-factor was low and it was next to impossible to eliminate the humming sound. An induction-type heater has lately been developed that has a better power factor, and is so solidly constructed that it is practically noiseless.

DATA WHERE ELECTRICITY ALONE IS USED FOR HEATING.

Experiments using electric heat as an auxiliary prove that it is most convenient, but give little information on the economy of using current alone. Data on this point were gathered from four houses using electricity alone for heating. The first of these, on Thirty-seventh Avenue, was fully equipped with heaters, heat-storage tanks, circulation pump, automatic heat control, recording wattmeters and all the apparatus that was needed for a complete test. There were nine rooms, four on the first floor and five above. The downstairs rooms were kept at 70° F. during the day and allowed to run down to 60° F. during the night. The upstairs part was maintained at about 65° F. during the day. Heat control was entirely automatic;

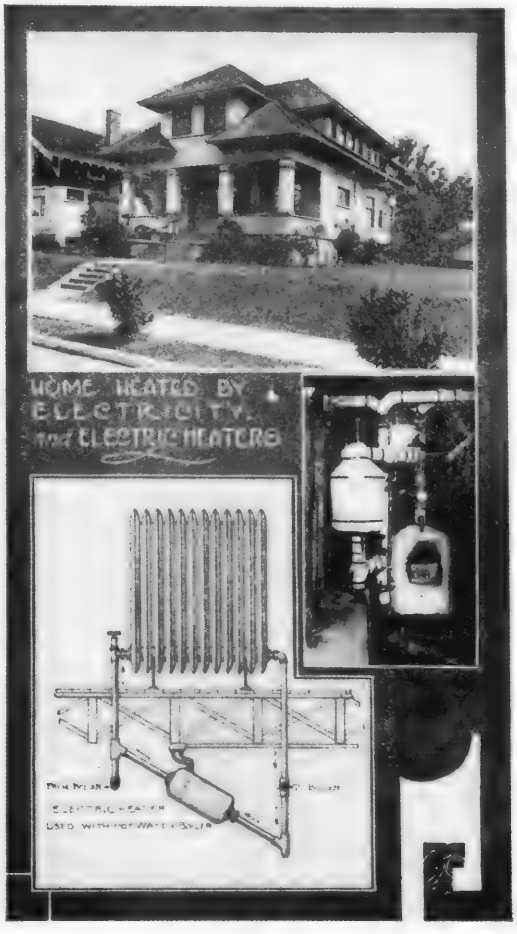


FIG. 2.

thermostats were used to keep the temperature within 2° of the desired mark, and current was turned on in the morning by timeswitch so that the house would be warm before time to arise.

The installation was made in February, 1914, and the house has been maintained at a comfortable temperature at all hours since, with practically no attention. Characteristics of the house are as follows:

First floor:
- Exposed wall area ... 2,492 sq. ft.
- Window area ..... 180 sq. ft.
- Contents .....10,475 cu. ft.

Second floor:
- Exposed wall area ... 2,357 sq. ft.
- Window area ..... 197 sq. ft.
- Contents .....12,275 cu. ft.

Floor surface is included in the wall area of the first floor to care for the unheated basement. Three-fourths of the ceiling is included in the wall area of the second floor.

The house is of first-class frame construction. The hot water heating system is of liberal design, with a total of 690 sq. ft. of radiation. Four 10½-kilowatt bayonet-type heaters were used, arranged in parallel with a storage tank of 500 gal. so that the water could circulate from the radiator through the heaters or through the storage tank. Time switch was used to disconnect the current entirely during the hours of lighting peak, amounting to 4½ hours in the winter months. Readings were taken daily for four months, beginning with September, 1914, of the average, maximum and minimum air temperatures, inside, upstairs and downstairs. Readings were also taken of the temperature of the circulating water, both outgoing and returning, to show the action of the storage tank. This tank has proved able to care for the hours when the current is cut off. The temperature at the end of the 4½ hours peak in December never dropped below 70° F. On the coldest days the water in the tank dropped from 190° to 104° F. during the peak, and the usual range of temperature during cold weather was from 170° to 180° F. in the tank at the time the current was turned off to 110° to 120° at the time it was turned on again. Readings on temperatures have not been made regularly since the four months' test, but occasional checks show that the temperatures maintained inside the house are practically the same as during the test. The table on Page 31 shows the average temperatures and current consumption by months.

Three other houses were equipped with the same system of electric hot water heat, and data collected for periods covering approximately two years.

	Aver. Temperatures Deg. F.				Average Difference		K. W. H.	
	Outside	Upstairs	Downstairs	Minimum Outside	Upstairs	Downstairs	To Storage Tank	Total
April, 1914	51	66	70	36	15	19	....	1,928
May "	57	67	70	43	10	13	....	968
June "	59	67	70	43	8	11	....	534
July "	64	..	..	49	..	..	....	79
August "	63	..	..	48	..	..	....	260
Sept. "	57	67	71	46	10	14	677	3,015
Oct. "	55	66	70	43	11	15	....	2,950
Nov. "	47	66	70	33	19	23	....	6,357
Dec. "	40	66	70	24	26	30	4,001	9,651
Jan., 1915	41	66	70	28	25	29	....	8,068
Feb. "	44	66	70	29	22	26	....	5,728
March "	50	66	70	34	16	20	....	4,290
April "	53	67	70	37	14	27	....	3,018
May "	56	67	71	44	11	15	....	2,954
June "	60	..	72	47	..	12	....	1,976
July "	64	..	..	52	..	..	....	284
August "	67	..	..	54	..	..	....	103
Sept. "	59	67	70	45	8	11	....	1.517
Oct. "	54	66	71	43	12	17	....	4,244
Nov. "	44	66	72	32	22	28	....	8,223
Dec. "	43	65	72	24	23	30	....	9,075
Jan., 1916	31	64	70	14	33	39	....	14,046
Feb. "	42	65	72	26	23	30	....	10,990
March "	44	66	72	32	22	28	....	8,500
April "	49	66	72	38	17	23	....	6,480

Synopsis showing the current used per year are given below. Characteristics of each house are omitted; the square feet of radiation, which was figured on the same basis as that in the Thirty-seventh Avenue house, is given in each case, and serves as a measure of the estimated heat requirements.

Address	225 37th N.	1505 36th	615 Terry	802 33d
Number of rooms	9	9	6	7
Kilowatt heaters	42	32	12	10
Square feet radiation	690	640	330	350
Consumption, first year, K.W.H.	42,850	39,320	57,210	54,930
Consumption, second year, K.W.H.	63,860	41,880	*18,100	*23,990
Average consumption, K.W.H.	53,355	40,600	.....	.....
Consumption per square foot of radiation per year, K.W.H.	77.3	63.4	.....	.....

* Used as auxiliary only during second year.

Sufficient data have been collected to enable the lighting department to make a definite statement as to what can be done in any given case. So many variable factors enter into the heating of a home that each house must be studied and estimated by itself. The problems presented are almost entirely the same that have been met with regularly in heating and ventilating, except that we have kilowatt hours to deal with instead of British thermal units. With electric heat the energy is, in general, several times as expensive as in the form of coal, so that every device for saving heat is valuable.

In the ordinary building with good ventilation the heat loss is about four-fifths through the walls, while one-fifth is used to heat the air. With improved heat insulation in buildings it is conceivable that half the heat now required may do the same work, without in any way impairing ventilation, which requires about 30 cu. ft. per minute for each person. Any improvement tending to reduce the amount of heat necessary gives an advantage to electricity as compared with lower priced sources of heat.

The hot water heating system, with ample storage tank, seems to present the most advantages for use with electric heaters. This is due to the fact that the heat storage keeps a uniform temperature, for less heat is required for

EXPERIMENTS WITH OIL-FILLED RADIATORS.

During 1915 a number of heating installations were made with oil-filled, electric-heated radiators. These consist of an ordinary hot-water radiator filled with oil and having a cartridge-type heater inserted in the top. This scheme of heating has the advantage that each room has its own heater, and no piping is necessary. The radiator in each room may be turned off when not needed, although nothing is to be gained by turning off the heat where a comfortable temperature is to be maintained for most of the day, because more heat will be needed to warm the room again than was saved while it was cooling. Results obtained with the oil radiators are the same in current required and temperatures maintained as with the hot water system, with the exception that there is very little storage of heat in the oil radiators to tide over the time when current is turned off.

Data on two houses with this system follow at bottom of page.

Address	2541 11th Ave. W.	1238 E. Fir
Number of rooms	5	9
Kilowatt heaters	10½	31½
Square feet radiation	160	640
Duration of test—months	7	7
Consumption, kilowatt hours	9,777	50,960
Estimate for one year, K.W.H.	16,000	85,000
Estimate per square foot radiation, K.W. H.	100	134

comfort with steady than with intermittent heat.

The tank, fitted with a small centrifugal circulating pump, will keep the house at an even temperature during the lighting peak when the current is shut off. Heating, however, cannot be permanently classed as an off-peak load. This is evident from the fact that about ten times the capacity of installation is necessary for heating a house that is used for lighting it. When one house in ten is electrically-heated, then the load curve valleys will be filled up. After that the success of heating by electricity demands cheap current at all times, which is only to be had from water power, generated in large units and distributed at comparatively high voltages. It may be feasible to serve heating customers at 400 to 500 volts three wire, which would materially reduce distribution cost.

ANALYSIS OF ELECTRIC HEATING COSTS.

The comparative cost of this method of heating is fairly well established. It is from 25% to 50% more expensive for electricity at ½ cent per kilowatt hour than for coal at $6.00 per ton. At 1 cent per kilowatt hour the electricity is two and one-half or three times as costly. These figures are borne out by theory, which says that the 10,000 B.T.U. in a pound of coal cost 0.3 cents, while in the form of current, the 3,413 B.T.U. in one kilowatt hour will cost ½ cent, making the current roughly five times as expensive. Then allowing for a furnace efficiency of 40%, which is fair for the ordinary furnace, the current would prove twice as expensive. The showing of less than one and one-half times made in the experiments is probably due to more care in the use of the heat so that less was wasted.

ADVANTAGES OF ELECTRIC HEAT.

It is very noticeable that once electric heat is installed in a home the occupants do not like to consider its removal. It delivers the home from the drudgery of building fires and handling coal and ashes, and banishes the disagreeable and injurious extremes of temperature so often tolerated now. It generates no poisonous gases and does not vitiate the air. It is, indeed, the ideal heat in everything save expense. The advantages of its use are sure to overbalance the additional expense involved for a great class of people who demand the best and are able and willing to pay for it, so that electric heat is certainly destined for a great development, even though it may never replace the more familiar forms now used.

Priming in a Heating Boiler

By H. S.

A large percentage of trouble in low pressure steam heating systems is caused by the priming of the boiler. Many steam fitters simply blow off the boiler under pressure and endeavor to cure the trouble in that way. In most cases this method is inadequate, as any grease or oil on the surface of the water will cling to the sides of the boiler as the water is being blown out through the blow-off valve. It is also surprising the number of fitters and boiler men who use soda in eliminating the foreign matter from the boiler. The soda is placed in the boiler through the safety valve connection and boiled up for a time. The water is then blown out by means of a hose. Where this is done, it is usually advisable to wash out the wet returns in the same manner.

Almost every heating boiler, particularly those which have been installed for a period of time, has an accumulation of sediment, mud, scale and other foreign matter lying at the bottom. It is difficult, in most cases, to get access to that part of the boiler in order for cleaning purposes, especially in the case of sectional cast-iron boilers having a water leg on each side. Foreign matter will collect at the bottom of these legs and, if not removed, will eventually cause a cracked section. Not only that, but foreign matter is the chief cause of

boiler priming and should be removed.

It would seem advisable that the American Society of Mechanical Engineers add to its cast-iron boiler code provision for a means of access to the parts other than the regular return inlet to the boiler.

The accompanying sketch suggests one method in which such a means of access can be provided. The proposed addition to the boiler code might read as follows:

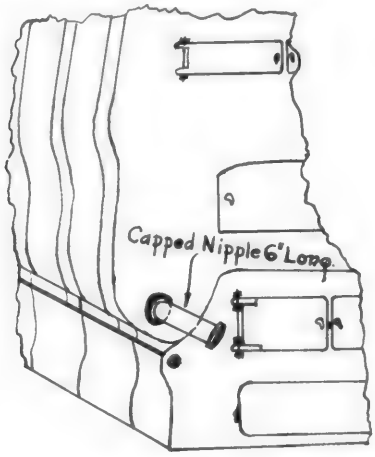


FIG. 1.—SECTION OF BOILER SHOWING PROPOSED CLEANOUT ON CAST-IRON BOILERS (NO SCALE).

"All cast-iron boilers of the double water-leg type to be provided with an opening, tapped at least 2 in. standard thread, on the outside of the bottom of each leg of the two end sections, for a cleanout. A 6-in. nipple, full size of opening, capped on the end, to be placed in aforementioned opening." A nipple, instead of a plug, should be used as it will be more accessible when the covering is placed on the boiler.

Although the foregoing is only a suggestion, the writer firmly believes that it is only a question of time before the heating trade will demand that this provision be made in all cast-iron boilers of the type mentioned.

When the boiler has been thoroughly cleaned at the bottom, it should be given what is known as a surface blow-off. The safety valve is unscrewed and in this connection is placed a bushing, usually down to ¾ in. A nipple and elbow is also used, being piped from this point to some convenient drain, such as a sewer connection or a sink. A hose can be utilized for this purpose, instead of a ¾-in. pipe, by screwing a hose coupling into the elbow and running a hose from this point. A fire should be built in the boiler after the boiler is refilled, and kept burning brightly during the entire operation. A small quantity of water should be kept running into the boiler, just enough so that it is heated up as fast as admitted. Naturally, this will depend upon how good a fire is burning in the boiler. It can readily be seen from the sketch that the hot water in the boiler will overflow through ¾-in. pipe, taking the oil and foreign matter on the surface of the water with it.

After operating the boiler in this manner for at least an hour, depending upon how soon the water becomes clear at the outlet, the fire should be slowed down and the water drawn out down to the normal water level of the boiler.

The combination of these two methods will always result in a clean boiler if the job is done in a thorough manner. Although it appears to be a long process,

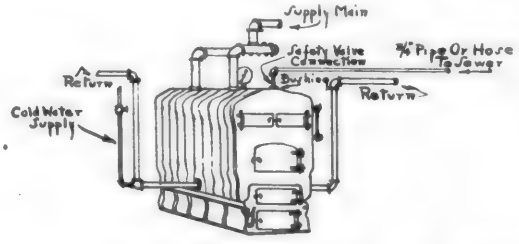


FIG. 2.—SHOWING CONNECTIONS FOR GIVING BOILER A SURFACE BLOWOFF.

satisfaction and economy in operation are the results of clean water in a heating boiler.

DETECTING BOILER PRIMING.

There are numerous ways by which boiler priming can be detected. The common way is to notice if the water line is fluctuating. At times this is deceptive, as when the water line is only varying slightly it does not seem that the steam could be lifting water with it. More conclusive evidence is obtained by pulling the safety valve with several pounds pressure on the boiler. If water comes out with the steam it is certain that the boiler is priming.

Ordinarily, when a boiler is priming, the water line is high when starting up and drops several inches when steam is on the system. Another indication is the surging of water up and down in the supply risers and radiator connections, usually those on the end of the line. It is peculiar how boiler priming affects the heating of the radiators at different times. Almost every time the system is cooled down and started up again, different radiators fail to heat or those that have not heated will become hot.

When a boiler has clean water in it, the owner really has a heater of larger capacity, because its steam-making powers are greater. It is safe to say that there is an increase in capacity of from 20% to 25%, although this fact is not usually considered.

Manufacturers who guarantee their boilers for a certain rating should specify in their guarantee that it is based upon clean water being used.

Requirements for the Heating and Ventilation of Industrial Buildings

Measures Taken in Thirteen States to Insure Suitable Working Conditions in Factories

While the factory inspection laws of all the States provide in a general way for healthful working conditions in factories, workshops and mencantile establishments, there are apparently but thirteen States that have definite regulations on the subject. These are New York, Massachusetts, Ohio, Illinois, Arkansas, Indiana, Iowa, Pennsylvania, Michigan, Minnesota, New Jersey, Wisconsin and California.

New York.

Under the present so-called "Labor Law" in New York State all matters pertaining to the heating and ventilation of industrial buildings are in the hands of an industrial commission under whose direction the State Department of Labor is conducted. According to the law, this commission "shall have the power to make rules and regulations for and fix standards of ventilation, temperature and humidity in factories and may prescribe the special means, if any, required for removing impurities or for reducing excessive heat, and the machinery, apparatus or appliances to be used for any of said purposes, and the construction, equipment, maintenance and operation thereof, in order to effectuate the purposes of this section."

The law also provides for a bureau of inspection which includes the bureau of factory inspection.

The general terms of the law covering factory ventilation are as follows:

Section 86. 1. The person operating every factory shall provide in each workroom thereof, proper and sufficient means of ventilation by natural or mechanical means, or both, as may be necessary, and shall maintain proper and sufficient ventilation and proper degrees of temperature and humidity in every workroom thereof at all times during working hours.

2. If dust, gases, fumes, vapors, fibers or other impurities are generated or released in the course of the business carried on in any workroom of a factory, in quantities tending to injure the health of the operatives, the person operating the factory, whether as owner or lessee of the whole or a part of the building in which the same is situated, or otherwise, shall provide suction devices that shall remove said impurities from the workroom at their point of origin where practicable, by means of proper hoods connected to conduits and exhaust fans of sufficient capacity to remove such impurities, and such fans shall be kept running constantly while such impurities are being generated or released. If, owing to the nature of the manufacturing process carried on in a factory workroom, excessive heat is created therein, the person or persons operating the factory as aforesaid shall provide, maintain, use and operate such special means or appliances as may be required to reduce such excessive heat.

As regards mercantile establishments a special section (Section 168-f) states that "every mercantile establishment shall be provided with proper and sufficient means of ventilation by natural or mechanical means, or both, as may be necessary and there shall be maintained therein proper and sufficient ventilation and proper degrees of temperature and humidity at all times during working hours. The industrial board shall make rules for and fix standards of ventilation, temperature and humidity in mercantile establishments."

RULES MADE BY THE INDUSTRIAL COMMISSION.

In accordance with the foregoing sections

of the "Labor Law," the Industrial Commission has promulgated a number of rules which have come to be known as the "Industrial Code." They are published, as compiled up to July 1, 1916, by the State Department of Labor, together with the law itself.

Following are the rulings bearing on the matters of heating and ventilation:

Rule 160. Ventilation. Every dressing room shall have at least one window or skylight opening directly to the outdoor air or air shaft, which shall be so constructed and maintained as to be easily opened at least one-half of its required area, except that in case a separate hospital or emergency room is provided and maintained at all times for the exclusive use of females and such room has a window or skylight opening to the outdoor air, the dressing room shall not be required to have such window or skylight.

Rule 161. Every dressing room, washroom or locker room enclosed by walls which extend to the ceiling, unless provided with windows which have an area opening directly to outdoor air, not less than one-tenth of the floor area, shall have exhaust ventilation equal to not less than six changes of air per hour at all times when such rooms are in use. A skylight shall be deemed the equivalent of a window, provided that it has fixed or movable louvres with openings of the net openable area prescribed for such window. In any such room, the commissioner may require such ventilation as may be necessary.

Rule 162. Heating and Illumination. Every dressing room shall be heated to a temperature of not less than 58° F., and shall be so lighted that all parts of the rooms are easily visible. If daylight is not sufficient for this purpose, artificial illumination shall be maintained at all times when the room is in use.

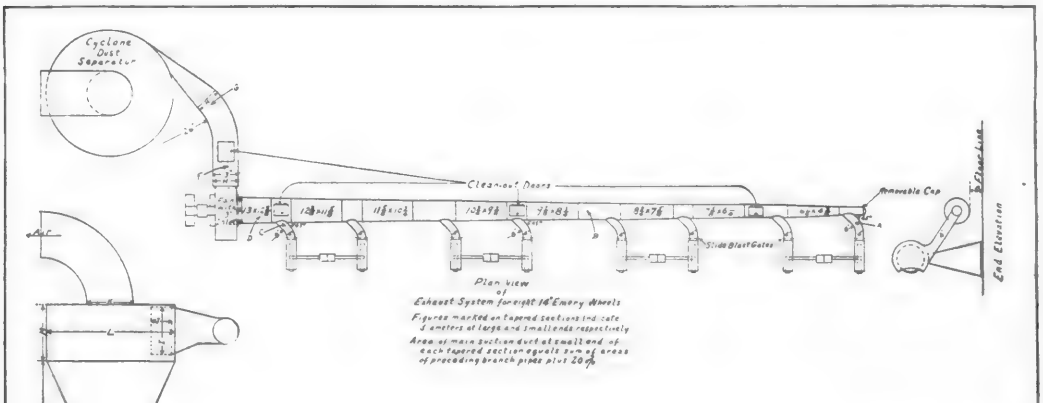
Rule 556 refers to the removal of smoke, steam, gases and dust from foundries. It is specified that "where smoke, steam, gases or dust arising from any part of the operations of the foundry are dangerous to health and where a natural circulation of air does not carry off such smoke, steam, gases or dust, there shall be installed and operated hoods, ventilators, fans or other mechanical means of ventilation approved by the commissioner of labor."

Rules 700-716 gives the appliances to be applied for the removal of dust, gases and fumes from grinding, polishing and buffing wheels, including the sizes of branch pipes, size of main pipes and fan inlets and outlets suction, arrangement and construction of pipes, etc.

Rule 718 provides for the removal of fumes, vapors and gases emitted or created in connection with some twenty special processes of manufacture.

Rule 721 gives similar arrangements for the removal of lead dusts and fumes in the manufacture or use of white lead, red lead, litharge, sugar of lead, arsenate of lead, lead chromate, lead sulphate, lead nitrate or fluosilicate, or in the manufacture of pottery, tiles or porcelain enameled sanitary ware, including the corroding or oxidizing of lead, and the crushing, mixing, sifting, grinding and packing of all lead salts or other compounds.

"Recommendations for the size of the cyclone separator or dust collected," states


Cyclone Dust Separator
Cleanout Doors
Removable Cap
Steam Blast Gates
Plan View of Exhaust System for eight 14" Emery Wheels
Figures marked on tapered sections indicate diameters at large and small ends respectively
Area of main suction duct at small end of each tapered section equals sum of areas of preceding branch pipes plus 20%
End Elevation
Dust Receptacle
Side Elevation Dust Separator
NEW YORK STATE
INDUSTRIAL COMMISSION
DEPARTMENT OF LABOR
BUREAU OF INSPECTION
DIVISION OF ENGINEERING

TYPICAL LAYOUT FOR EIGHT 14-IN. EMERY WHEEL EXHAUST SYSTEM.
(Reference and Dimension Letters are Merely for Convenience of Inspectors.)

the code, "are hard to give, as the separator must be proportioned to suit operating conditions, light dusts requiring a larger separator than heavy dusts. The following table, reproduced from the catalogue of a prominent separator manufacturer, gives dimensions of separators stated to be suitable for metallic dusts and wood shavings. A separator should be selected the area of whose inlet is at least as large as the area of the discharge pipe from the fan. For light buffing dusts, lint, etc., the air outlet from the top of the separator should be so large that the velocity of discharge will not exceed 300 to 480 ft. per minute; a separator should be selected of which the other dimensions are proportionate. The air outlet should be provided with a proper canopy or elbow to exclude the weather, but should be otherwise unobstructed. There should be ample clearance under the separator for the accumulation or storage of the dust which should never be allowed to pile up as high as the bottom of the separator.

"To give a sample illustration, the appended drawing shows an exhaust system laid out in conformity with these specifications for eight 14-in. emery wheels. For eight 14-in. buffing wheels, the branch pipes would have to be not less than 4½ in. in diameter, and the increased size of the main suction duct and the fan determined in accordance with Rule 703. The main discharge pipe and the cyclone separator should be considerably larger for buffing wheels than for emery wheels.

DUST SEPARATORS

Diameter of fan outlet in inches	Area of fan outlet in square inches	Openings in Separator					Dimensions of Separator			Shipping weight, lbs.
		Size of inlet in inches	Area of inlet in square in.	Diameter of air outlet in inches	Area of air in outlet in square in.	Diameter of dust outlet in inches	Outside diameter of cylinder in inches	Height of cylinder in in	Length of cone in in.	
5	20	2½ x 9	23	8½	56	3	29½	14	26½	70
6	28	3 x 10½	32	10	78	4	35½	15½	32½	100
7	38									
or	or	3½ x 13	47	13	132	6	41½	18½	37½	140
8	50									
9	63	4½ x 16	72	15	176	6	47½	21	43½	175
10	78	5 x 18	90	17	227	6	53½	23	50	245
11	95									
or	or	5½ x 21	115	20	314	10	59½	26	56	315
12	113									
13	133									
or	or	6½ x 24	156	23½	433	10	65½	29	61½	395
14	154									
15	177	7 x 27	189	26	531	10	71½	32	67½	490
16	201									
or	or	8 x 30	240	28	615	10	77½	35	72½	575
17	227									
18	254	8½ x 32	272	31	754	10	83½	38	77½	715
19	283									
or	or	9 x 35	315	33	855	10	89½	41	82½	875
20	314									
21	316	9 x 40	360	36	1,017	10	93½	46	85½	930
22	380	10 x 41	410	39	1,194	10	97½	47	89	1,000
23	415									
or	or	10½ x 43	451	41	1,320	11	101½	49	93	1,095
24	452									
25	491	11 x 45	495	44	1,520	11	105½	51	97	1,455
26	531	11 x 48	528	46	1,662	12	109½	54	99½	1,600
27	572	11 x 51	561	49	1,885	12	113½	57	103½	1,700
28	621	11½ x 54	621	52	2,123	12	117½	60	109½	1,855
29	660	12 x 57	684	55	2,375	12	121½	63	111½	2,035
30	707	12 x 60	720	58	2,642	12	125½	66	115½	2,155
31	754									
or	or	12½ x 63	807	61	2,922	13	129½	69	118½	2,250
32	804									
33	855	13 x 66	858	64	3,217	13	133½	72	122½	2,420
34	908	13½ x 69	932	67	3,525	13	137½	75	126½	2,555
35	962	14 x 72	1,008	70	3,848	14	141½	78	129½	2,745
36	1,017									
or	or	14½ x 75	1,087	73	4,185	14	145½	81	133½	2,900
37	1,075									
38	1,134	15 x 78	1,170	76	4,536	14	149½	84	137½	3,065
39	1,194									
or	or	15½ x 81	1,255	79	4,901	14	153½	87	141½	3,235
40	1,256									
41	1,320	16 x 84	1,344	82	5,281	14	157½	90	145½	3,39[illegible]

"The following table gives the diameter in inches of the main suction duct at any point for any number of uniform-size branch pipes when the area of the main at any point is made equal to the combined areas of the branch pipes preceding that point plus 20%, the minimum required by these specifications."

Violations of the provisions of the labor law are punished by fines running from $20.00 to $50.00 for the first offense. Second and third offences incur penalties running up to $250.00 and imprisonment for 60 days.

Number of branch pipes	Diameter of branch pipes in inches								
	3	3½	4	4½	5	5½	6	6½	7
	Area of each branch pipe in square inches								
	7 07	9 62	12 566	15.9	19 635	23.758	28.274	33.183	38.485
	Area of each branch pipe plus 20 per cent (square inches)								
	8 484	11 544	15.08	19 08	23.562	28.51	33.93	39 82	46.182
1	3⅜	3⅞	4⅜	5	5½	6	6⅝	7⅛	7⅝
2	4¾	5½	6¼	7	7¾	8⅜	9⅛	10⅛	10⅞
3	5¾	6⅝	7⅝	8⅝	9½	10⅓	11⅛	12⅜	13⅛
4	6⅝	7⅝	8⅝	9⅞	11	12⅛	13⅛	14⅛	15⅛
5	7⅜	8⅝	9⅞	11	12⅛	13⅛	14⅜	16	17⅛
6	8⅛	9⅛	10⅜	12⅛	13⅛	14⅜	16⅛	17⅛	18⅜
7	8¾	10¼	11⅝	13⅛	14⅜	16	17⅛	18⅞	20¼
8	9⅜	10¼	12⅝	14	15⅛	17⅛	18⅛	20⅛	21⅞
9	9⅞	11⅛	13⅛	14⅞	16⅛	18⅛	19⅛	21⅛	23
10	10½	12⅛	13⅞	15⅜	17⅜	19⅛	20⅜	22⅛	24⅛
11	11	12¾	14⅝	16⅜	18⅛	20	21⅞	23⅜	25⅛
12	11½	13⅜	15⅛	17⅛	19	20⅞	22⅜	24⅜	26⅛
13	11⅞	13⅞	15⅞	17⅝	19¾	21¾	23⅛	25⅜	27⅛
14	12⅜	14⅜	16⅛	18⅛	20½	22⅛	24⅛	26⅛	28⅛
15	12⅝	14⅞	17	19⅛	21⅛	23⅛	25⅛	27⅛	29⅛
16	13⅛	15⅜	17⅝	19⅜	22	24⅛	26⅜	28⅛	30⅜
17	13⅝	15⅞	18⅛	20⅜	22⅝	24⅞	27⅛	29⅜	31⅛
18	14	16⅜	18⅝	21	23¼	25⅛	27⅝	30⅛	32⅛
19	14⅜	16⅞	19⅛	21⅛	23⅞	26¼	28¼	31⅛	33⅛
20	14⅞	17⅛	19⅝	22⅛	24⅛	27	29⅛	31⅞	34⅛
21	15⅛	17⅝	20⅛	22⅝	25⅛	27⅝	30⅛	32⅛	35⅛
22	15⅝	18	20⅝	23⅛	25⅝	28⅜	30⅞	33⅛	36
23	15⅞	18⅛	21⅛	23¾	26⅛	29	31⅛	34⅛	36⅛
24	16⅛	18⅞	21½	24⅛	26⅞	29⅝	32⅛	34⅞	37⅛
25	16½	19⅛	22	24⅞	27½	30⅛	32⅞	35⅛	38⅛
26	16⅞	19⅝	22⅝	25⅛	28	30⅞	33⅛	36⅛	39⅛
27	17⅛	20	22⅞	25⅝	28⅛	31⅛	34⅛	37	39⅞
28	17⅝	20⅜	23⅛	26⅛	29	32	34⅞	37⅛	40⅜
29	17⅞	20⅞	23⅝	26⅝	29½	32½	35⅛	38⅝	41⅛
30	18	21	24	27	30	33	36	39	42

PRACTICE OF THE NEW YORK STATE INDUSTRIAL COMMISSION.

"It is a customary practice in the Department when we find it necessary to install exhaust systems for the purpose of carrying away dust and gases, etc., to issue orders and set a time when compliance is necessary."—JAMES L. GERNON, First Deputy Commissioner, Bureau of Inspection.

Massachusetts.

The Massachusetts law went into effect November 1, 1913 (Acts of 1913, Chapter 655). This law is enforced by the Building Inspection Department of the District Police and reads as follows:

"Section 15. No building which is designed to be used, in whole or in part, and no building in which alterations shall be made for the purpose of using, or continuing its use, in whole or in part, as a public building, public or private institution, schoolhouse, church, theatre, special hall, public hall, miscellaneous hall, place of assemblage or place of public resort, or as a factory, workshop or mercantile or other establishment and to have accommodations for ten or more employees, and no building more than two stories in height, designed to be used above the second story, in whole or in part * * * shall be erected, and no alteration shall be made therein, until a copy of the plans and specifi-

cations thereof has been deposited with the supervisor of plans of the building inspection department of the district police by the person causing its erection or alteration, or by the architect thereof. Such plans and specifications shall include those for heating, ventilating and sanitation, as the supervisor of the plans may require."

A fine of from $500.00 to $1,000.00 is provided for anyone who violates the provision of this requirement.

PRACTICE OF THE MASSACHUSETTS BUILDING INSPECTION DEPARTMENT OF THE DISTRICT POLICE.

"This Department has no regulations relating to the heating and ventilating of factory buildings, but such work is taken up only in special cases by the State Board of Labor and Industries, and applies to factories where buffing and grinding wheels, etc., are used; and to the ventilation of sanitaries in factory buildings. The matter of heating and ventilating factories has not been compulsory except in special cases in certain factories on account of the processes used in manufacturing and also on account of the number of employees distributed in rooms to operate the machines, etc. The Massachusetts law provides that, if so directed, plans for heating and ventilation shall be filed with the plan of the building thereof.—J. J. CAREY, Deputy Chief.

Ohio.

The Ohio laws governing factory and building inspection states in Section 989 that each district inspector of workshops and factories assigned to a district for the inspection of shops and factories therein, shall carefully inspect the sanitary conditions, system of sewerage * * * system of heating, lighting and ventilating rooms where persons are employed at labor," etc.

Under the power conferred by Section 996, if he finds "that the heating, lighting, ventilation or sanitary arrangements of a shop or factory are injurious to the health of persons employed or residing therein, * * * he shall notify the owner, proprietor or agent of such shop or factory or building by personally serving a notice in writing or mailing it to his last known address, to make the necessary alterations or additions. Said notice shall describe the alterations and additions which shall be installed therein and the time in which each alteration or addition therein required shall be made and each appliance installed."

Penalties are provided running from $50.00 to $100.00 per day after the expiration of the time limit set by the inspector for making required changes.

The term "shops and factories" includes the following: Manufacturing, mechanical, electrical, mercantile, art and laundering establishments, printing, telegraph and telephone offices, railroad depots, hotels, memorial buildings, tenement and department (apartment) houses.

In connection with the safe-guarding of machinery, owners and operators of shops and factories are required to make suitable provision for emery wheels and for metal and wood-working machinery generally. The various requirements and the methods prescribed for fulfilling them are given in detail in the code.

The penalty for failing to comply with the provisions of the code within 30 days vary from $100.00 to $300.00 for each offense.

Additional provisions are included (Section 6330-2) covering especially dangerous works or processes, such as the manufacture of white lead, red lead, litharge, sugar of lead, arsenate of lead, lead chromate, lead sulphate, lead nitrate, or fluo-silicate. In such cases "every employer shall without cost to the employees, provide * * * devices, means and methods for the protection of his employees who, while engaged in any work or process included in section 2 are exposed to lead dusts, lead fumes or lead solutions:

"(*a*) Working rooms, hoods and air exhausts for the protection of employees engaged in any work or process which produces lead dusts or lead fumes. The employer shall provide and maintain work rooms adequately lighted and ventilated, and so arranged that there is a continuous and sufficient change of air, and all such rooms shall be fully ventilated and separated by partition walls from all departments in which the work or process is of a non-dusty character; and all such rooms shall be provided with floor, permitting an easy removal of dust by wet methods or vacuum cleaning, and all such floors shall be so cleaned daily.

"Every work or process referred to (given above) including the corroding or oxidizing of lead, and the crushing, mixing, sifting, graining and packing of all lead salts or other compounds shall be so conducted and such adequate devices provided and maintained by the employer as to protect the employee, as far as possible from contact with lead dust or lead fumes. Every kettle, vessel, receptacle or furnace in which lead in any form referred to is being melted or treated, and any place where the contents of such kettles, receptacles or furnaces are discharged, shall be provided with a hood connected with an efficient air exhaust; all vessels or containers in which dry lead in any chemical form or combination

referred to, is being conveyed from one place to another within the factory, shall be equipped, at the places where the same are filled or discharged, with hoods having connection with an efficient air-exhaust; and all hoppers, chutes, conveyors, elevators, separators, vents from separators, dumps, pulverizers, chasers, dry pans, or other apparatus for drying pulp lead, dry-pans dump, and all barrel packers and cars of other receptacles into which corrosions are at the time emptied, shall be connected to an efficient dust-collecting system; such system to be regulated by the discharge of air from a fan, pump, or other apparatus, either through a cloth dust-collector having an area of not less than ½ sq. ft. of cloth to every cubic foot of air passing through it per minute, the dust collector to be placed in a separate room which no employee shall be required or allowed to enter, except for essential repairs, while the works are in operation; or such other apparatus as will efficiently remove the lead dusts from the air before it is discharged into the outer air."

In Cleveland, Ohio, a new building code became effective October 14, 1913. It is known as Ordinance No. 29,798. This code has the following relating to "factories and workshops:"

"Every building, room or part thereof hereafter erected for, or converted to use as a factory or workshop in which there shall be less than 20 sq. ft. of floor space for each employee or occupant, shall have in operation, while occupied, a mechanical system of ventilation so designed and installed as to provide at least six complete air changes per hour.

"Unless natural ventilation is provided as required by the ordinances of the City of Cleveland, and maintained while occupied, every factory in which there is more than 20 sq. ft. of floor space for each employee or occupant, shall have in operation, while occupied, a system of ventilation so designed and installed as to provide at least four complete air changes per hour."

PRACTICE OF THE INDUSTRIAL COMMISSION OF OHIO.

"The specific requirements for the construction of factories (Title 7) has not yet been adopted by this Department. The heating systems approved in this Department for factory construction are either a direct steam or blast system, or may be a furnace blast system. The only ventilation required in factories is that which is obtained through the windows. The new, modern type of factory construction has considerable glass area for light. Either double-hung windows, or pivoted sash are used, and we find the ventilation in these cases very satisfactory. However, we find in some of the old factory buildings a very limited amount of windows and the air in these cases is very bad. Then it is necessary for the Chief to exercise his authority by ordering some type of ventilation to be installed."—GEORGE H. HAMILTON, Chief Deputy, Department of Inspection.

Illinois.

The Illinois law regarding the heating and ventilation of factory buildings is probably the most explicit of any so far enacted in this country. It is entitled, "An act to provide for the health, safety and comfort of employees in factories, mercantile establishments, mills and workshops in Illinois and to provide for the enforcement thereof." (Reenacted and approved June 29, 1915. In force July 1, 1915.)

Section 10 reads: "In every factory, mercantile establishment, mill or workshop, where one or more persons are employed, adequate measures shall be taken for securing and maintaining a reasonable and, as far as possible, equable temperature, consistent with the reasonable requirements of the manufacturing process. No unnecessary humidity which will jeopardize the health of employees shall be permitted."

The meat of the law is in Section 11 which reads: "In every room or apartment of any factory, mercantile establishment, mill or workshop, where one or more persons are employed, at least 500 cu. ft. of air space shall be provided for each and every person employed therein, and fresh air, to the amount specified in this act, shall be supplied in such a manner as not to create injurious drafts, nor cause the temperature of any such room or apartment to fall materially below the average temperature maintained: Provided, where lights are used which do not consume oxygen, 250 cu. ft. of air space shall be deemed sufficient. All rooms or apartments of any factory, mercantile establishment, mill or workshop, having at least 2,000 cu. ft. of air space for each and every person employed in each room or apartment, and having outside windows and doors whose area, shall not be required to have artificial means of ventilation; but all such rooms or apartments shall be properly aired before beginning work for the day and during the meal hours. All such rooms, or apartments, having less than 2,000 cu. ft. of air space, but more than 500 cu. ft. of air space, for each and every person employed therein, and which have outside windows, and doors whose area is at least one-eighth of the floor area, shall be provided

with artificial means of ventilation, which shall be in operation when the outside temperature requires the windows to be kept closed, and which shall supply during each working hour at least 1,500 cu. ft. of fresh air for each and every person employed therein. All such rooms or apartments, having less than 500 cu. ft. of air space for each and every person employed therein, all rooms or apartments having no outside windows or doors, and all rooms or apartments having less than 2,000 cu. ft. of air space for each and every person employed therein, and in which the outside window and door area is less than one-eighth of the floor area, shall be provided with artificial means of ventilation, which will supply during each working hour throughout the year, at least, 1,800 cu. ft. of fresh air for each and every person employed therein: Provided, that the provisions of the preceding portions of this section shall not apply to storage rooms or vaults: And, provided, further, that the preceding portions of this section shall not apply to those rooms or apartments in which manufacturing processes are carried on which from their peculiar nature would be materially interfered with by the provisions of this section. No part of the fresh air supply required by this section shall be taken from any cellar or basement.

"The following terms of this section shall be interpreted to mean: the air space available for each person is the total interior volume of a room, expressed in cubic feet, without any deductions for machinery contained therein, divided by the average number of persons employed therein.

"Outside windows and doors are those connecting directly with the outside air; the window and door area is the total area of the windows and doors of all outside openings: and the floor area is the total floor area of each room."

"Sec. 12. All factories, mercantile establishments, mills or workshops shall be kept free from gas or effluvia arising from any sewer, drain, privy or other nuisance on the premises. All poisonous or noxious fumes or gases arising from any process, and all dust of a character injurious to the health of the persons employed, which is created in the course of a manufacturing process, within such factory, mill or workshop, shall be removed, as far as practicable, by either ventilating or exhaust devices."

Section 20 covers the ventilation of toilet rooms to the effect that, "where practicable, they shall direct ventilation with the outside air; where it is impracticable (to so locate them), they shall be placed in an enclosure * * * and separately ventilated.

Section 25 * * * When general changes relative to the location and spacing of machinery or to ventilation have been made and such changes comply with the provisions of this act, such arrangements, conditions remaining the same, shall not be disturbed by any requirement of the chief state factory inspector or his deputies within the period of twelve months.

Fines for failure to comply with the foregoing provisions run from $10.00 to $50.00 for the first offense, and from $25.00 to $200.00 for the second or subsequent offense.

All buildings and rooms occupied by butterine and ice cream manufacturers must be provided with air shafts, windows and ventilating pipes sufficient to insure ventilation. The factory inspector directs such installations. The law also provides for blowers in workshops where emery wheels or emery belts of any description are used.

PRACTICE OF THE ILLINOIS DEPARTMENT OF FACTORY INSPECTION.

"We have no specific requirements as to heating, but you will note that Section 11 provides that artificial ventilation, when required, must be applied in a manner which will not cause injurious drafts or materially alter the temperature of the room."—OSCAR F. NELSON, Chief.

Arkansas.

Factory ventilation requirements in Arkansas are contained in the Workmen's Compensation Law which reads as follows:

Section 5. The commissioner, as State factory inspector (or deputy State factory inspector) shall have power to enter any factory or mill, workshop, private works or State institution which have shops or factories, when the same are open or in operation, for the purpose of gathering facts and statistics such as are contemplated by this act, and to examine into the methods of protection from danger to employees and the sanitary conditions in and around such buildings and places: and to make a record thereof of such inspection. If the commissioner as State factory inspector (or deputy State factory inspector) shall find upon such inspection that the heating, lighting, ventilation or other sanitary arrangement of any workshop or factories is such as to be injurious to the health of the persons employed or residing therein * * * he shall notify, in writing, the owner, proprietor or agent of such workshops or factories to make, within thirty days, the alterations or additions by him deemed necessary for the safety and protection of the employees; and if such alterations or additions are not made within

thirty days from the date of such written notice, or within such time, as said alterations or additions can be made with proper diligence upon the part of such proprietors, owners or agents, said proprietors, owners or agents so notified shall be deemed guilty of a misdemeanor, and upon complaint of a commissioner as State factory inspector before a court of competent jurisdiction, and upon conviction thereof, shall be fined in a sum not less than $25.00 nor more than $200.00, or by imprisonment not more than ninety days, or by both such fine and imprisonment.

Section 6. The following expressions used in this act shall have the following meanings:

The expression "person" means an individual corporation, partnership or association.

The expression "children" means minor persons under the age of fourteen years.

The expression "minor" means a male person under the age of twenty-one, or a female under the age of eighteen years.

The expression "women" means female persons of eighteen years of age and upward.

The expression "factory" means any premises where steam, water, or other mechanical power is used in aid of any manufacturing process there carried on.

The expression "workshop" means any premises, room, or place, not being a factory as above defined, wherein any manual labor is exercised by way of trade, or for the purpose of gain in or incidental to any process of making, altering, repairing, ornamenting, finishing or adapting for sale any article or part of an article, and to which or over which premises, room or place the employer of the person or persons working therein has the right of access or control; provided, however, that the exercise of manual labor in a private house, or a private room by the family dwelling therein, or by any of them, or in case a majority of persons therein employed are members of such family, shall not of itself constitute such house or room a workshop within this definition.

The aforesaid expressions shall have the meanings above defined for them respectively in all laws of this State relating to the employment of labor, unless a different meaning is plainly required by the context.

Indiana.

The Indiana Law on ventilation of industrial buildings states that "there shall be sufficient means of ventilation provided in each workroom of every manufacturing or mercantile establishment, laundry, renovating works, bakery, or printing office within the state, and the chief inspector shall notify the owner in writing to provide or cause to be provided ample and proper means of ventilation for such workroom."

Owners or agents are to be prosecuted for non-compliance with the law within twenty days. The law also provides for exhaust fans for carrying off dust from emery wheels, grindstones and dust creating machinery, the size of mains, etc., being specified.

Iowa.

In Iowa there is a law relating to exhausting systems for emery wheels or emery belts of any description, or tumbling barrels used for rumbling or polishing castings. "Any factory, workshop, print shop," the law adds, "or other place where molten metal or other material which gives off deleterious gases or fumes is kept or used, shall be equipped with pipes or flues so arranged as to give easy escape to such gases or fumes into the open air, or provided with other adequate ventilators."

Pennsylvania.

The Pennsylvania requirements regarding blowers and exhausters for use with grinding and polishing machinery, are enforced by the Industrial Board of the state. This board publishes a set of directions covering suction test and piping, and other features.

Michigan.

In Michigan, a law provides for exhaust systems for carrying off dust from emery wheels and grindstones and dust creating machinery "wherever deemed necessary by the factory inspector." There is also a rule covering the ventilation of foundries and detailed directions are given for complying with the law.

Minnesota.

The Minnesota law after specifying that each employee must have not less than 400 cu. ft. of air space unless reduced by a special order of the Commissioner of Labor, goes on to provide for "sufficient means of ventilation" where excessive heat is created, or if steam, gases, vapors, dust or other impurities that might be injurious to health, are generated.

New Jersey.

The New Jersey law provides for exhaust systems in workshops where emery wheels or emery belts of any description are used. Regarding sizes of rooms, it is specified that not less than 250 cu. ft. of air space shall be provided for each employee, between 6 a. m. and 6 p. m., and not less than 400 cu. ft. of air space between 6 p. m. and 6 a. m. Regarding the ventilation of the factory itself, the law, as amended by act approved February 26th, 1912, reads as follows:

"The owner, agent or lessee of a place coming under the provisions of this act shall provide, in each workroom thereof, proper and sufficient means of ventilation, and shall maintain proper and sufficient ventilation; if excessive heat be created or if steam, gases, vapors, dust or other impurities that may be injurious to health be generated in the course of the manufacturing process carried on therein, the room shall be ventilated in such a manner as to render them harmless, so far as is practicable; in case of failure, the Commissioner of Labor shall order such ventilation to be provided."

Compliance with the law must be made within twenty days on penalty of $10.00 fine for each day beyond that limit. Exhaust fans must also be provided in foundries where smoke, steam, dust or noxious gases are not promptly carried off by the general ventilation. The requirements for mercantile establishments state that "the owner, agent or lessee of a place coming under the provision of this act, or employer, shall provide in each mercantile establishment proper and sufficient means of ventilation; in case of failure, the commissioner shall order such ventilation to be provided."

A similar penalty clause is added as for workrooms.

Wisconsin.

The requirements in Wisconsin are in the form of general orders of the State Industrial Commission. Order No. 2,000 deals with hoods for grinding, buffing and polishing wheels.

Orders No. 2,001-2,006 deal with suction pipes for hoods, amount of suction required, position of main pipe and dust collector.

Orders No. 2,007 to 2,010, cover belts, drums, rolls and disks for grinding, buffing, polishing or sanding; sand blasts and tumbling barrels.

Orders No. 2,011 to 2,013 deal with machines which create dust, vats and tanks which emit fumes, and furnaces and forges.

Order No. 2,014 provides for the ventilation of foundries, forgeshops and roundhouses.

Order No. 2,015 covers workrooms where there is less than 900 and more than 300 cu. ft. of air space per person. All such rooms in which there is no smoke, gas, fumes, dust, vapors or fires consuming oxygen "must be provided with a ventilating system which will furnish 1,800 cu. ft. of fresh air per hour to each person. Additional ventilation must be provided where there are lights or fires in such rooms."

Other rooms containing 900 cu. ft. of air space per employee "must be provided with a ventilating system which will change the air in the room not less than twice each hour. Such system must be so designed as not to produce injurious drafts or reduce the temperatures materially below the average temperature maintained."

Order No. 2,205 reads: "In each toilet room heretofore installed, and which is so located that it is impossible to secure light and air directly from the outside, a flue or mechanical ventilating system must be installed which will provide adequate ventilation.

"In Wisconsin the Industrial Commission has power to issue orders for any changes in existing and new systems. The factory head may make an appeal from the agents ruling and if the majority of the commission decides against him, he must make the required changes. This decision can only be reached after the majority of the commission have visited his factory personally and examined the existing conditions."

California.

The factory ventilation law in California provides that "Every factory or workshop in which five or more persons are employed shall be so ventilated while work is carried on therein that the air shall not become so exhausted as to be injurious to the health of the persons employed therein, and shall also be so ventilated as to render harmless, as far as practicable, all the gases, vapors, dust, or other impurities generated in the course of the manufacturing process or handicraft carried on therein, that may be injurious to health."

The law also provides for the removal of dust, filaments or injurious gases by means of exhaust fans or blowers together with the usual system of pipes and hoods.

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EFFORTS on the part of heating engineers, both individually and collectively, to come to an agreement regarding a uniform set of heat loss coefficients, have been so futile that it is no wonder the younger men in the profession are bewildered by the conflicting data on the subject. And this confusion is only intensified when reference is made to the various "standard" works on the subject, for there the variance is equally marked. Even among the more experienced engineers there must be at times some misgivings when it is considered that their calculations may vary, as was illustrated in a recent notable instance, over 50% for the same interior.

This being the situation, there is considerable point to the suggestion made by a correspondent that there is a "glaring need of a board or society to decide once and for all, or until such time as tests will prove otherwise," such points as those mentioned. "If this cannot be done," continues our correspondent, "then let one of the leading magazines representing the heating profession step in and lead the way, so to speak. Then, may I ask, what magazine is in a better position to do this than THE HEATING AND VENTILATING MAGAZINE?"

Aside from the compliment contained in our correspondent's suggestion, which is fully appreciated, there is a challenge here that cannot be ignored. After giving the matter careful consideration, it strikes us as possible to promulgate a set of factors that may be considered as tentative standards, at least, with the idea of arousing discussion and, at length, getting them down to a basis that will meet with general approval.

With this idea in mind, we have undertaken to publish in serial form what, we hope, will become the nucleus of a heating engineers' data book. It is our intention to present these data in suitable form for separate binding and, after sufficient discussion, to add revision sheets where necessary.

If we shall have the co-operation of our readers in this matter, a reliable data code will develop that will represent the opinions of no one journal or engineer, but the collective opinion of the profession.

The first of these data sheets will appear in the February issue.

AMONG the suggestions for heating symbols and abbreviations, made at the recent meeting of the British heating engineers, is one which, we should think, would be especially welcome to American engineers. In place of the British thermal unit, or B.T.U., it is proposed to use the word "Therms" and to indicate it by the Greek letter, theta (θ), with this difference, that the letter would have a bar extended beyond the vertical lines. The definition would remain the same as at present.

The Consulting Engineer

"The Consulting Engineer" is prepared to reply, in this department, to any questions which our readers may ask regarding problems connected with the design and installation of mechanical equipments of buildings.

CONDUCTED BY IRA N. EVANS

70—Operating Steam-Jacketed Kettles.

QUESTION: I have a number of steam-jacketed kettles which I wish to operate from a boiler carrying 90 lbs. of steam and return the condensation to the boiler. The jackets of the kettles are built for a pressure of 150 lbs. The pressure will have to be varied in the jackets to obtain the temperature desired for different classes of cooking. How can this be done?

ANSWER: The proper method of handling the condensation for these kettles is by a return trap. The trap is a tank connected with the receiver, as shown in the accompanying sketch, in such a manner that the pressure is relieved, and the pressure on the apparatus forces the condensation into the trap or tank. By means of a float or by the weight of water in the tank tilting it, the steam from the boiler is turned into the tank on top of the condensation in the trap, through pipe C. This equalizes the boiler pressure and causes the water to flow back through the return pipe, as shown. While the trap is connected to the boiler, a check valve D closes and prevents the pressure from entering the system of returns.

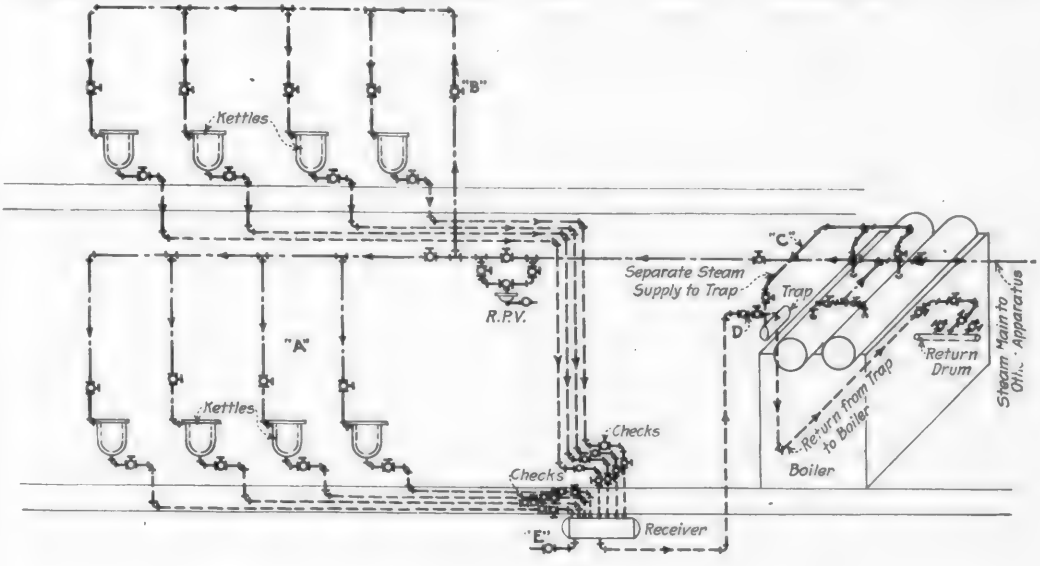
When the trap is emptied of water the float rises or the tank moves, depending on the type used, this action being due to the lessened weight automatically closing the steam valve in the pipe C. At the same time an air valve opens and relieves the pressure in the tank. Check D now opens and takes another charge of water from the system. This operation is repeated, the tilting of the trap automatically connecting the tank with the system of returns and then to the boiler.

As above stated, valve C, or the steam-equalizing pipe from the boiler, is opened or closed by a float or by the tank itself as it is filled and emptied.

In case there is no quick relief for the steam pressure in the tank after emptying, a period of time has to elapse until the radiation condenses the residual steam and reduces the pressure.

All kettles should be connected as shown and separate returns, with checks, run to the receiver. R,P.V. is a pressure reducing valve which can be operated at any pressure below that on the boiler that will raise the water from the receiver to the top of the boiler, where the trap is placed.

The kettles are shown in two series, A and B. Lower pressures may be carried on the upper set equal to the difference in level of



TYPICAL SCHEME FOR OPERATING STEAM-JACKETED KETTLES.

kettles A and B, but no more. If higher pressures are carried on series B than on Series A, the checks will close on A and they will not return. The receiving tank should be at least 3 ft. below the lowest point of kettles A.

Care must be taken to have a separate steam connection (c) for the trap, or if taken off any other line, the pressure may be reduced sufficiently over that on the boiler proper that the system will not return.

Checks and valves should all be placed as shown. Considerable difference in pressures can be carried in the different kettles of Series B by throttling, equal to height of the column of water in the drop legs on each return, as, with the checks, the various differences in pressure will be equalized. This is not true of kettle A, as there is less fall.

Care should also be taken, if possible, to return the trap to boiler through a separate line, with checks and hand valves, as when connected to other pipes, varying pressures may interfere with the proper operation of the trap. The writer used this system in a large hotel kitchen in Boston and it gave perfect satisfaction and was fool-proof. There is no more economical method of accomplishing this operation as it does away entirely with drain traps and all circuits are sealed.

E is a free blow provided, to be connected to sewer or feed water heater through a drain trap, in case anything should happen, such as the return trap failing to work, while the kettles had to be operated. If the drain trap is placed at a fairly good height above the receiver, it can be left open permanently and if the water gets above the inlet to the drain trap, it will relieve the receiver. This is apt to be bad for when the condensation has to be blown away without the drain trap, the extra work and steam required will force the operating hands to fix the return trap, while if it is ready for service or open all the time, it may go into operation when the return trap fails to work and not be disturbed for months, thus wasting a considerable amount of heat and hot water.

The writer sometimes purposely arranges apparatus such as the return trap mentioned so that the system will be difficult to operate if the return trap fails to work, thus insuring prompt attention and repair when necessary.

71—Function of Tempering and Heating Coils.

QUESTION: Please tell me in your magazine what is the use of tempering coils with a fan system of heating. Why are two sets of coils used with a fan system?

ANSWER: Tempering coils are used to raise the temperature of all outdoor air as soon as it is admitted to the building to 70° F., or the room temperature, for the following reasons:

1. All the air admitted has to be raised to this temperature at some point and it is more economical, both from an operating and installation standpoint, to heat it all in one stack at a central point.

2. If the air were passed cold through ducts to individual stacks the same amount of work would have to be done, yet the cold air would chill the building and the individual stacks might freeze in extreme weather. Some years ago the old New York County Court House, in New York, was heated without a tempering coil near the air inlet and nearly all of the individual coils under the flues froze or burst at one time or another. A tempering stack, which was turned on all the time to give the initial rise to the outdoor air, remedied this condition, when the system was remodeled.

3. As different rooms need different amounts of heat and some are apt to heat more easily than others, it is much simpler to raise the air to a common temperature, say, 70° F., and then pass it through a reheating stack, automatically controlled for each room. When the room is at the proper temperature and the air is needed for ventilation, it is passed around or through the auxiliary stack without additional heat, and unobstructed.

4. Tempering coils are absolutely necessary in case of humidifying as the air cannot be humidified unless it is 40° F. or above, as it will not physically absorb moisture and is apt to freeze the water.

The foregoing reasons are sufficient to warrant the use of the two sets of coils and make it exceedingly bad practice to omit the tempering coil.

LEGAL DECISIONS

Extensions.

A gas company was required by the California Commission to extend its mains for lighting and heating purposes to serve residents in an outlying section upon condition that applicants guarantee for three years a minimum charge sufficient to meet their proportion of the operating expense and 10% of the cost of the extension, to cover interest and depreciation thereon, where the prospective revenue would not justify an extension under ordinary conditions. Lofgren vs. Pacific Gas & Electric Co., California.

Rate Making.

The Colorado Springs Light, Heat & Power Company, a public utility engaged in the sale of electricity for lighting, heating and power purposes, and in the sale of gas for lighting and heating, and of steam for heating purposes, is the owner of three properties of the following present fair value for rate-making purposes, *viz.*, electrical property, $1,481,762; gas property, $710,917; steam property, $122,774. In an application by the company for an increase of gas rates, it was held that excessive rates should not be charged for one kind of service in order to maintain the other two properties of the company. *Re* Colorado Springs Light, Heat & Power Co.

Heating Systems for Automobiles.

The Circuit Court of Appeals, Sixth Circuit, holds that the Williams patent, No. 873,399, for a heating and ventilating system for automobiles, as the claims were amended to meet the requirements of the Patent Office, is for an indirect or circulatory system having as one of the elements of the combination a register which may be opened and closed by the occupants of the car, and is not infringed by a system which heats by direct radiation and has no register. "All heating apparatus," the Court said, "is one or the other of two types, direct or indirect. In the direct the heating body or box is in the room to be heated, and the radiator is *direct;* in the indirect the heating box is outside the room to be heated and it heats a body of air in passing over it, which body of air is then conducted to the room to be heated, thus *indirectly* accomplishing the result. The two systems are also distinguished as "radiating" and "circulatory." In the heating of houses the ordinary hot-air furnace is circulatory or indirect; the more common steam system, with a radiator in each room, is radiating or direct; though steam heating is sometimes applied on the indirect system by passing fresh air from outside over the body of steam coils in the cellar and carrying the heated air into the room through pipes and registers. The Williams patent belongs to the circulatory class. The defendant Pelton's patent belongs to the direct or radiatory class. He had two forms of his device. In the first, the radiating coil was below the floor of the car, and it was surrounded by a tight box, except as it carried an open grating on top and in the floor of the car. It might be possible to consider this as a radiator box. In the second form, the radiating coils were in the body of the car, and surrounded by no box, but partly covered by a protecting screen or hood." Pelton vs. Williams, 235 Fed., 131.

"When Steam is Turned on Plant" Construed.

In an action on a contract for installing a heating and ventilating plant, a provision in the contract that the second installment of the purchase price should be paid "when steam is turned on plant" was construed in accordance with the significance given to the term by the trade to mean when steam is generated in the boiler, circulates through the steam mains and branches leading to the radiators, and the plant is in operation. American Heating & Plumbing Corpn. vs. Salomon & Co., 195 Ill. App., 297.

Bureau of Mines Working to Increase Efficiency in Heating and Power Plants.

One of the recommendations made in the last annual report of the Bureau of Mines, which has just been issued by Director Van. H. Manning, is that a special investigation be authorized to increase efficiency in the heating and power plants in the public buildings of the United States. It is also urged that such work be conducted with the advice and co-operation of the various bureaus and departments interested, because it will be necessary for engineers of the bureau to visit the plants in order to determine the best fuel to be used and what changes in equipment or method of apparatus are advisable, and to obtain data on fuel costs.

British Heating Engineers Recommend Use of Metric System.

An important action taken at the annual meeting of the Institution of Heating and Ventilating Engineers during its sessions in London, last October, was a proposal "that the members should adopt whenever possible the use of the metric system."

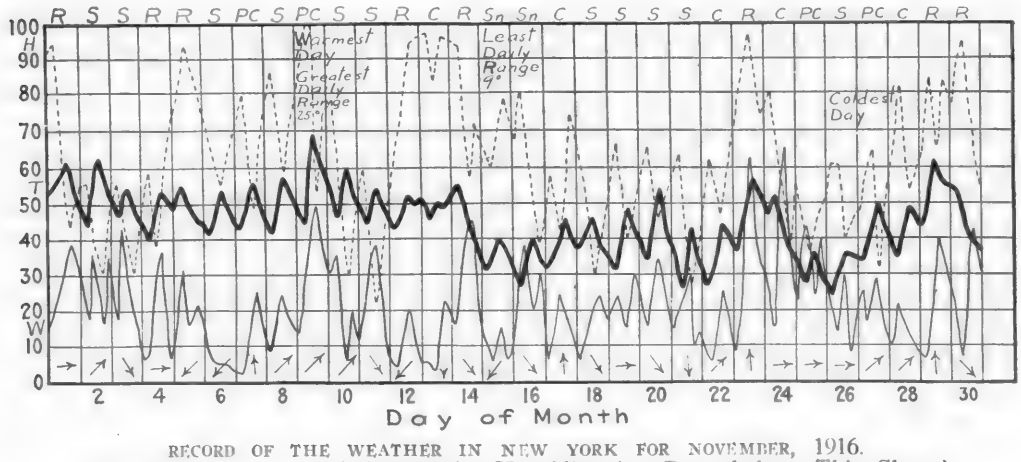
Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

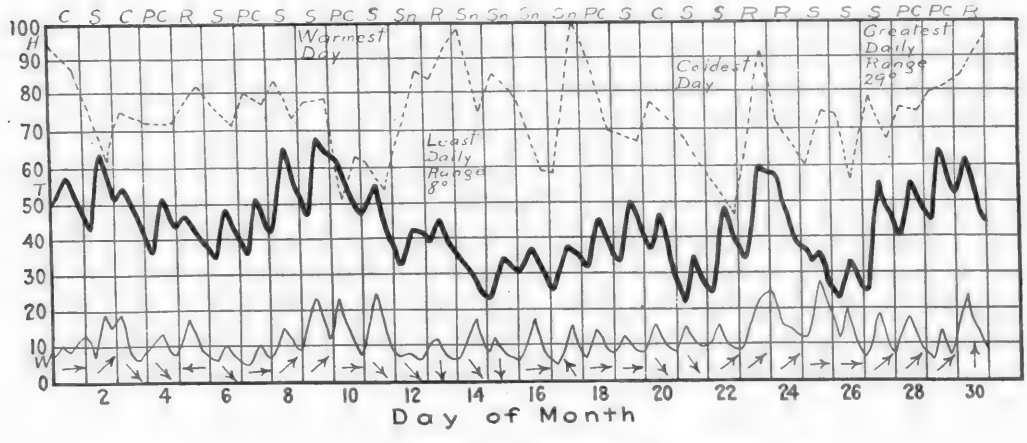
Vacuum Heating Systems. Charles L. Hubbard. 1500 w. Pwr—Oct. 3, 1916. Details of three systems in present use. 20c.

The Weather for November, 1916

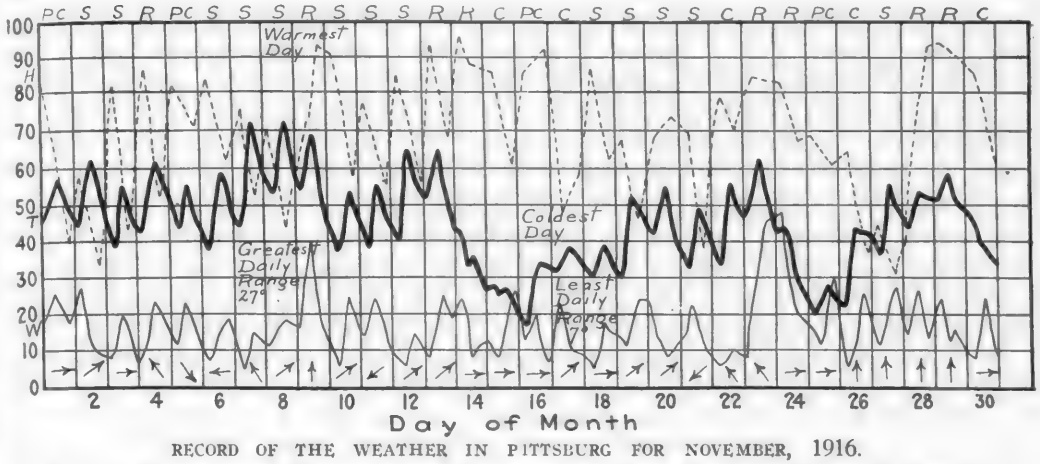
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature degrees F.	69	68	71	74	79
Date of highest temperature	9	9	8	6	4
Lowest temperature, degrees F.	25	22	18	14	15
Date of lowest temperature	26	21	16	14	14
Greatest daily range, degrees F.	25	29	27	25	28
Date of greatest daily range	9	27	7	6	16
Least daily range, degrees F.	9	8	7	3	9
Date of least daily range	15	13	17	11	24
Normal temperature for month, deg. F.	44.7	43	44	43.2	49.2
Normal mean temperature for month, deg. F.	44	41.2	42.9	39.2	43.4
Total rainfall, inches	1.57	1.67	1.86	2.11	2.53
Total snowfall, inches	Trace	0.7	0.3	0.1	0.1
Normal precipitation, this month, in.	3.44	4.1	2.55	2.5	2.88
Total wind movement, miles	12800	7687	9157	10354	11047
Average hourly wind velocity, miles	17.8	10.7	12.7	14.4	15.3
Prevailing direction of wind	S.W.	W.	S.W.	S.W.	S.
Number of clear days	13	11	13	11	19
Number of partly cloudy days	4	8	5	7	4
Number of cloudy days	13	11	12	12	7
Number of days on which rain fell	10	8	8	9	5
Number of days on which snow fell	2	5	4	5	2



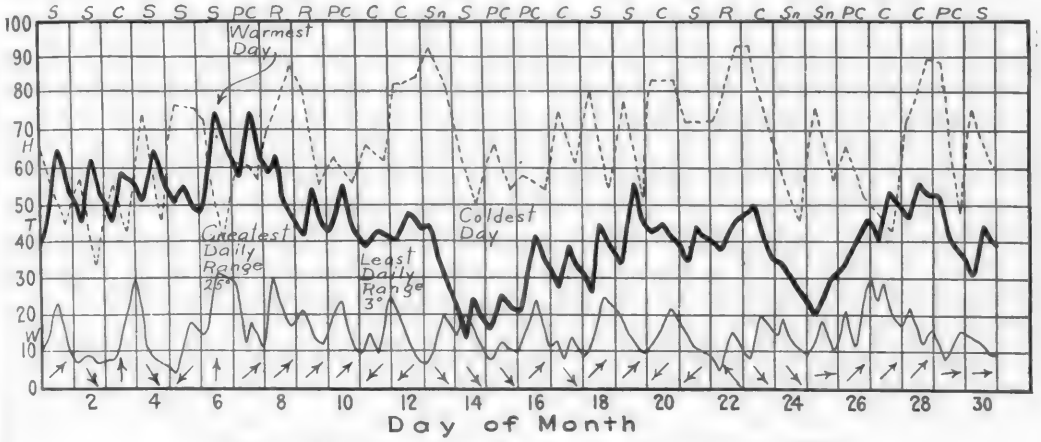
RECORD OF THE WEATHER IN NEW YORK FOR NOVEMBER, 1916.
(Hourly Observations of the Relative Humidity Are Recorded on This Chart.)



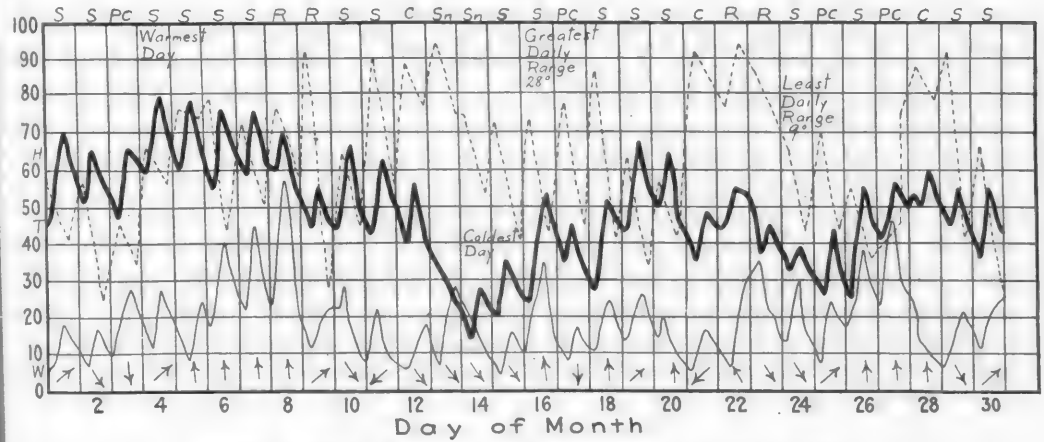
RECORD OF THE WEATHER IN BOSTON FOR NOVEMBER, 1916.



RECORD OF THE WEATHER IN PITTSBURG FOR NOVEMBER, 1916.



RECORD OF THE WEATHER IN CHICAGO FOR NOVEMBER, 1916.



RECORD OF THE WEATHER IN ST. LOUIS FOR NOVEMBER, 1916.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.

Heavy lines indicate temperature in degrees F.

Light lines indicate wind in miles per hour.

Broken lines indicate relative humidity in percentage from readings taken at 8 A. M. and 8 P. M.

S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.

Arrows fly with prevailing direction of wind.

CORRESPONDENCE

Variations in Engineering Practice.

EDITOR HEATING AND VENTILATING MAGAZINE:

As the author of Question No. 67, which appeared in the November issue, I wish to thank you and the "Consulting Engineer" for the time spent in replying to the query. As for the answer, however, it looks like an evasion, or lack of knowledge, which a consulting engineer should not have to admit.

It may be of interest to you to know that all your subscribers are not heating engineers and I have no doubt that a large number are students, probably engaged for the most part in offices doing a heating business. As for myself, I am an architectural draftsman desiring to acquaint myself with as much knowledge relative to heating as possible, hence my reason for subscribing to your magazine. If we were all first-class heating engineers, I fear that THE HEATING and VENTILATING MAGAZINE would be of little use, for then the diffusion of knowledge pertaining to heating would be unnecessary.

Now if this line of reasoning is true, then when articles are written or advice given by technical men, they should not lose sight of the fact that it will be the weakest among the readers that will absorb the most and he is frequently the one who cannot so readily separate the facts from assumptions, unless they are so marked.

In looking over some back numbers on the subject of heat transmission from radiators, I note that the different authors are at variance with each other to a marked degree. In the issue for May, 1914, George Stumpf, Jr., gives two tables in his article which I copied at the time and have used in my work with satisfaction, as far as I know. In the issue for March, 1915, Charles A. Fuller gives a table taken from a book of which he is author, and in the issue for September, 1915, E. D. Bottsford gives a table which is from 3% to 5% higher than the values given by Mr. Fuller. Herewith are the three tables for comparison.

It is not my purpose to criticise any of these authors, but I would like to point out the glaring need of a board or society to decide once and for all (as suggested by Professor John R. Allen in the issue for September, 1914) or until such time as tests will prove otherwise, such points as the above. If this cannot be done, then let one of the leading magazines representing the heating profession step in and lead the way, so to speak. Then may I ask what magazine is in a better position to do this work than THE HEATING AND VENTILATING MAGAZINE?

Permit me to call your attention to the article in the issue for November, 1916, by E. B. Johnson. There, we see, he has taken an average from different authorities for the loss of heat through glass per square foot per hour for a difference of 70° F. between inside and outside temperatures, as 71 B.T.U. In articles published in other magazines for the same conditions, Mr. Fuller allows 70 B.T.U., Mr. Hubbard allows 85 B.T.U. and Mr. Russel allows 84 B.T.U. Here Mr. Hubbard is 21.4% higher than Mr. Fuller.

Referring to the same article mentioned above, in Table 3 you will note that for a

B.T.U. TRANSMITTED PER SQUARE FOOT PER 150° F. DIFFERENCE BETWEEN TEMPERATURE OF STEAM IN RADIATOR AND THAT OF AIR IN ROOM.

	Height of radiators.									
	Charles A. Fuller				Ed. D. Bottsford				George Stumpf, Jr.	
	22	26	32	38	22	26	32	38	22 to 26	32 to 38
One-col	285	279	275	270	300	295	290	285	287	261
2-col.	270	263	257	250	290	280	275	270	272	248
3-col.	255	248	240	231	270	260	255	250	238	210
4-col.	240	233	225	218	250	240	235	230	222	230
Window	278	...	...	...	...	...	...	...	...	...
Pipe coils	300	...	...	...	...	...	...	...	...	...
Vertical wall rad.	285	...	...	...	310	...	...	...	* 272	
Horizontal wall rad.	292	...	...	...	300	...	...	...	* 300	

* Average for 5 sq. ft. and 7 sq. ft. sections.

room temperature of 70° F., a radiator will give off 240 B.T.U. per square foot per hour. It has always been my impression that such would be the case when the steam in the radiator is at a certain temperature and that the room temperature is not the factor to be considered, but rather the difference in temperatures of the steam in the radiator and that of the air in the room. If we assume 1.67 B.T.U. per square foot per degree difference for a radiator, then $240 \div 1.67 = 144 + 70 = 214$ which would be the temperature of the steam upon which the table is based.

It is my opinion that most men look to the magazines as the source from which they glean most of their knowledge and if such is true, then the articles should be written with that in mind. The foregoing is written without malice and in the hope that it is constructive, rather than destructive. Anybody can tear down, but it is hard to build and if what has been stated will help the one trying to build to see some of the requirements of the less-trained men in the profession, then what has been written will not be in vain.

F. W. P.

Pittsburgh, Pa., November, 1916.

REPLY BY IRA N. EVANS.

The writer regrets that he has created the impression that the correspondent's question was evasively answered. The question referred to concerned the relative merits of different types of gas heaters when used for heating purposes, questioning, we assume, some of the manufacturers' statements as set forth in their literature. If the manufacturers will back up their statements with a written guarantee in any particular case, it would seem to the writer a superior engineering opinion to any we could furnish.

The correspondent refers to a series of transmission for radiation, questioning a 5% difference in results, as shown by different authors. It is difficult to see the connection, inasmuch as these transmissions would not apply to the gas heater conditions.

There is danger of error in using engineering data taken from various sources, unless assured of its reliability, either from experience or research. The transmission figured out in our answer is within the limits obtained for fan coils, which are analogous to the case in hand, and it is so stated in the answer. It seems to us that the simple and inexpensive method indicated of testing the apparatus would enable the correspondent to obtain his information first hand. There are, however, a series of exhaustive tests made by Willis H. Carrier and presented to the American Society of Mechanical Engineers (published in THE HEATING AND VENTILATING MAGAZINE for January, 1912, which give the coefficients for a wide range of temperature of air over heating surface. These, however, would be useless unless the velocity and temperature of the gas and water were known or assumed.

It would, no doubt, be a good idea to have a board of engineers pass on the reliability of data, but they could not furnish any data themselves by simply meeting together, as these tests take time and money.

There is no question that there are puzzling discrepancies in many of the data on heating, but there is reason for this as it is almost impossible to hit upon the future condition of a building in the plan stage, as to heating, with absolute certainty. The only thing we can do is to get enough surface to meet the possibilities.

In designing steel work, a factor of safety of four or five is used, because it is never known what the overload is likely to be and the structure can only fall once. In heating practice, if the apparatus fails, it can be added to at more or less expense, so that we do not need to allow the same factor of safety. On the other hand, if our price is high, we lose the job.

Figuring Duct and Flue Sizes.

EDITOR HEATING AND VENTILATING MAGAZINE:

Referring to the article "Comparison of Various Methods of Figuring Duct and Flue Sizes" in the October issue, Table No. 4 gives the following outlet distances:

E F = 100 + 50 = 150 ft.
G = 120 + 50 = 170 ft.
H = 140 + 50 = 190 ft.

By count on plan of Fig. 1, I get:

E F = 120 + 50 = 170 ft.
G = 140 + 50 = 190 ft.
H = 160 + 50 = 210 ft.

Why is the distance, E., left out?

Los Angeles, Cal., November, 1916.

L. A. W.

REPLY BY H. A. ALT.

The distance, E, referred to by correspondent, is not a *duct* distance but is a vertical *flue* length of 20 ft. The United States government does not consider the length of a vertical flue as having any direct bearing on the size of a duct supplying same, and therefore, the length, E, was omitted in computing the length of the *duct* traversed by the air to the outlets in question.

Undoubtedly this treatment is based on the fact that warm air in a flue will usually not only overcome the flue friction but will make the flue act as a chimney, actually causing an acceleration of flow for a high flue. Witness the increased velocity in a hot air furnace pipe leading to the second floor (generally figured at 380 ft. per minute) against the velocity in a similar pipe leading to the first floor (where only 260 ft. velocity is attained.)

Of course, where air for ventilation only is supplied, this being at 70° F. and the same as the room temperature, the chimney action is not present, but on most systems the air is likely to go over 70°, rather than under it, and so in the majority of cases it is entirely correct to omit a vertical flue in considering duct resistance to air flow.

The United States government rule as given in "Mechanical Equipment of Federal Buildings" is as follows:

"Main duct at the fan is to be made the same size as the fan outlet . . . Refer to equalization table and note how many 1 in. x 1 in. pipes are given as being equal in carrying capacity to this main duct. Divide number of pipes by capacity of fan in C.F.M." (This gives the "factor" as mentioned in the article.) "Multiply amount of air delivered to the base of each flue by the distance of said *flue* from the fan (distance meaning length of *duct*, adding equivalent for turns, etc.) and divide this product by the amount of air handled by the fan. This gives the average distance of all *outlets* from the fan. Next multiply the amount of air to each flue by the fraction" (factor) "above obtained. This will give the number of 1 in. x 1 in. pipes to be allowed to each flue. This number is subject to correction as follows:

"For *each 1 foot* by which the distance (including the equivalent for bends) from *fan* to *base of flue* exceeds the 'average distance' previously obtained, 1/3 of 1% is to be added to the number of 1 in. x 1 in. pipes previously allowed for each flue. If the distance is less than the 'average distance' the correction is to be deducted instead of added.

"Now refer to equalization table and find the size of square pipe equivalent to the corrected number of 1 in. x 1 in. pipes for each flue. This is the size of the branch pipe at the base of the flue. Add all the branches back to the fan on the equalization table, and if the work is correct it will add up the size of main duct you started with."

It will be seen from this that no attention is paid to flue lengths and their velocities are later stated as being about 600 ft. per minute. In order to suit the particular system used as a sample some of the conditions were not the ones commonly encountered in government work where, according to the explanation, they evidently put all the horizontal ducts in the basement with vertical flues running direct to the outlets above and do not have additional horizontal runs from the top of the flues, such as is shown at the top of Flue E in Fig. 1. However, the object of the article was to indicate the various general schemes of sizing without going very much into the finer details of design, and it would seem that this method is longer and more tedious than some of the others given which produce equally good and efficient results.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Programme for Annual Meeting.

The two outstanding features of the forthcoming meeting of The American Society of Heating and Ventilating Engineers, in New York, January 16-18, will be a session on drying and one on boiler testing. The drying session will be given over to the reading and discussion of three papers, one by F. R. Still, of the American Blower Company; one by J. O. Ross, of the B. F. Sturtevant Company; and one by G. C. Shadwell, of the Improved Appliance Company, of Brooklyn. The boiler testing session will start off with a presentation of the principal points brought out in the paper on "Testing of House Heating Boilers," by Professor L. P. Breckenridge and D. B. Prentice, presented at the recent annual meeting of the mechanical engineers' society. This will be followed by a report of the committee of the New York Chapter which is at work on the project of perfecting a boiler testing code that can be used as a standard. The subject will then be open for general discussion.

Among the papers scheduled for the various sessions are the following:

"Transmission of Steam in a Central Heating System," by J. H. Walker, of Detroit.

"The Efficiency of Underground Conduits," by George H. Nichols, Chief Engineer, Office of State Architect, Albany, N. Y.

"Heating, Ventilating and Electrical Equipment in the Philadelphia School Buildings," by J. D. Cassell, Chief Engineer, Board of Education, Philadelphia.

"Some Notes on Warm Air Furnace Heating," by J. M. McHenry, of Detroit.

"Heating of Temporary School Buildings, in Detroit," by J. R. McColl.

"New Type of Dust Separator," by William J. Baldwin, New York, supplementing his talk and demonstration at last summer's Detroit meeting.

"Prevention of Corrosion in Pipe," by F. N.

Speller, Pittsburgh, supplementing a paper on the same topic presented last year, and containing new test data obtained by use of deoxidizing method for taking oxygen out of water.

ENTERTAINMENT PROGRAMME.

In this year's entertainment programme, a feature will be made of luncheon and matinée parties for the visiting ladies. On Tuesday afternoon, the opening day of the meeting, the ladies will be taken to the Rialto to see the moving pictures and later will meet for a dinner party at Churchill's. There will be nothing special on the programme Wednesday morning, but in the afternoon a matinée party will be made up to see "Follow Me," at the Casino.

The annual dinner of the society will be held at the Hotel Astor. A different banquet hall has been secured from that of last year, this year's quarters being on the ground floor on the 44th Street side.

The Thursday programme consists of visit to Wanamaker's where luncheon will be served and the party will later hear a piano and organ recital in the auditorium.

The members of the Entertainment Committee are: A. S. Armagnac, chairman; R. W. Pryor, Jr. (dinner), P. H. Seward (finance), William H. Driscoll (ladies), George D. Farnham (programme), M. W. Franklin (speakers), D. D. Kimball, W. H. McKiever, George W. Martin, Walter S. Timmis, A. E. Carpenter, Jr., G. A. Dornheim, E. F. Glore, W. G. LeCompte, H. G. Issertell and B. K. Strader.

Address on Form for Choosing Bidders and Awarding Contracts Presented Before Illinois Chapter.

A live topic was up for discussion before the Illinois Chapter at its December meeting when Herman Wallace Nelson addressed the meeting on "The Nelson Form for Choosing Bidders and Awarding Contracts." One of the principal features of the plan proposed by Mr. Nelson is that providing for compensation for estimates submitted. "Competition," said Mr. Nelson, "is essentially an American Institution, but I do not believe in the kind of competition some architects believe in." The building owner, he declared, who receives the benefit of competition should pay for that competition and justly distribute the cost of same. The uncertainties of the business, he added, of which that of free estimating occupied a prominent place, was the cause of such a low proportion of successes as are reported in the heating contracting business.

Mr. Nelson's remarks were listened to by an appreciative gathering of over forty of the chapter's members and guests. At the conclusion of his talk he was given an enthusiastic vote of thanks.

The meeting, which was held at the Engineers' Club, Chicago, December 11, was opened by President F. W. Powers. Before the main subject of the evening was taken up, it was voted to invite the American Society of Heating and Ventilating Engineers to hold its next mid-summer meeting in Chicago.

The main features of the Nelson forms for choosing bidders and awarding contractors, cover the following items:

1. That the owner of a building may have just as much fair competition as he wishes to pay a reasonable and fair price for.

2. That when and after the owner has chosen his competition in a fair, unprejudiced manner, and has further paid a just and reasonable price for such competition, he shall be under no moral or other obligation to the bidders.

3. That the owner may, as he chooses, select a limited or large number of bidders. If the work is of a private nature, he may wish to choose a very limited number, if he wants competition at all.

4. If the work be of a public nature, the owners may have good reason for first selecting a limited number of bidders, because of their residence, near the work, or because they may be familiar with or may have had previous experience with the work, or for other justifiable reasons.

5. That when the owners, in case of public work have chosen their preferred bidders, they may give every other public citizen who is qualified to bid, an opportunity to compete by chance or lot for consideration as a bidder, limiting the number to be chosen in accordance with the value of the competition to him.

6. That if an owner cannot or will not provide complete detailed plans and specifications for the work, but wants estimates, measurements, figures or advice of a professional nature, the owner shall consider such work in the light of a professional service, and it shall not be considered proper, fair or just to ask for competitive price bids, but that the charges for such service shall be left solely for adjustment between the owner and the contractor either before or after the work is done.

New York Chapter Advances Movement for Standard Boiler-Testing Code.

A decided impetus was given at the December meeting of the New York Chapter to the movement to formulate a standard method of testing house-heating boilers. This matter has been growing more pressing ever since the power boiler code of The American Society of Mechanical Engineers was adopted, but the immediate cause of its discussion at this time was the paper presented before the mechanical engineers' society last month (published in THE HEATING AND VENTILATING MAGAZINE for December) by Professors L. B. Breckenridge and D. B. Prentice on "The Testing of House Heating Boilers."

The guests of honor, all of whom came prepared to discuss the proposition at length, were André Mertzanoff, chief engineer of the American Radiator Company's Institute of Thermal Research, in Buffalo; Professor John R. Allen, president of the Detroit Chapter of the heating engineers' society; and E. E. McNair, general manager of sales for the United States Radiator Corporation of Detroit.

As a result of the discussion Homer Addams, P. H. Seward and Walter S. Timmis were appointed a committee to prepare a report on the project for submission at the annual meeting of the heating engineers' society in January.

The chapter met as usual at the Building Trades Club and was called to order by President Arthur Ritter. After the routine business was disposed of, including a report from the chapter's entertainment committee, the chairman turned the meeting over to Homer Addams who was in charge of the December programme.

Mr. Addams lost no time in expressing his conception of the purpose of the meeting, which was to take some practical and definite steps to push along the preparation of a code so that the society, at its annual meeting, could take action that would lead to its final adoption, and thus receive the proper credit for such a code, which, he said, at present it is in danger of losing.

André Mertzanoff, who was the first speaker, was introduced by Frank T. Chapman. Mr. Mertzanoff told in an interesting manner of the methods used in Europe for the testing of low-pressure boilers and explained how the results of these tests were published under government auspices, thus giving an unquestioned authority to the findings.

The next speaker, E. E. McNair, took up in detail the recommendations made by Professors Breckenridge and Prentice. He considered that a classification of boilers such as that recommended in the paper referred to, where it was proposed to limit heating boilers to those up to 2,000 sq. ft. radiation capacity is unnecessary. He proposed that the distinction should be that of power boilers and low pressure boilers, the latter being one that returns the condensation to the boiler. He also proposed that boilers should be tested at their maximum efficiency. As to a test of 12 hours, he said boilers are usually rated on 8-hour firing periods, so that a 12-hr. test would not be sufficient. A test of 24 or 32 hours would be more like what is required.

The United States Radiator Corporation's method is to test the boiler when operating at atmospheric pressure. The steam generated is carried through a separator and exhausted to the open air. Credit is given the boiler for raising the temperature of the water from feed temperature to 212° F. To this amount 2% is arbitrarily added for moisture. Mr. McNair described the test in detail, the boiler being given a "running start" before the test is commenced.

In concluding he stated that besides the proposed boiler code the trade needs a standard code for testing radiators, and he proposed the establishment of a national testing bureau for appliances used in heating and ventilating work. While the manufacturers' tests are good, they are always likely to be questioned, he said, simply because they are made by the manufacturers themselves.

Prof. Allen, who then spoke, called attention to the fact that the Breckenridge and Prentice code provides for no firing rate. The length of test, he said, must be some multiple of that rate. He commended the thoroughness of the European boiler tests as described by Mr. Mertzanoff, which he described as giving "so many B.T.U. at the steam nozzle." He also endorsed the idea of a running start and in testing at atmospheric pressure. As chairman of a committee of the society on testing, he stated that he hoped to have something in connection with a code for testing radiators which would be ready for the next midsummer meeting of the society.

Professor Allen said that he had no doubt the University of Michigan would be glad to nationalize its testing bureau. He urged that such a bureau should be under the direction of a committee of the society.

A written discussion by Roy E. Lynd, of the Richardson & Boynton Company, was presented and was referred to the chapter's new committee on the subject.

Before the vote was taken on the appointment of the committee, P. H. Seward

urged that the work of compiling a testing code should not attempt to include that of rating boilers. "What we need," he said, "is some standard method of testing by which a purchaser can make a comparison of two or more boilers under his consideration; in other words, a test code for the actual capacity and efficiency of heating boilers under ordinary operating conditions, as distinguished from commercial ratings."

Eastern Pennsylvania Chapter.

Stewart A. Jellett, former president of The American Society of Heating and Ventilating Engineers, was the principal speaker at the December meeting of the Eastern Pennsylvania Chapter, held at the Engineers' Club, Philadelphia, December 14. His subject was "The Duty of the Engineer to His Client and Himself." Mr. Jellett urged the engineer to take into consideration more fully the needs of his clients and to fulfill them with economy and efficiency at all times.

The attendance surpassed that of any previous meeting of the chapter and included the following guests: E. C. Wiley, Lynchburg, Va.; W. S. Moffett, Staunton, Va.; and James A. Donnelly, New York.

At the dinner, which preceded the technical meeting, a leather tobacco pouch, bearing the chapter's monogram, was presented to each guest, by the chapter. Accompanying this souvenir was a novel briar-wood pipe, made to be filled from the bottom, designed and presented by James A. Donnelly.

The following were elected to membership in the chapter: John Gormly, honorary; R. C. Bolsinger, C. E. Bonnet, M. G. Gillett, George A. Haupt, John J. Liner, William J. Murphy, P. M. O'Connell and Charles G. Reever, regular; and H. D. Kellogg, associate.

American Public Health Association is about to inaugurate a health employment bureau whereby the services of members of the association may be brought to the notice of prospective employers. Employers will be notified of the creation of the bureau with the idea of stimulating them to appeal directly to the bureau when they are in need of expert aid. Selakar M. Gunn, 755 Boylston St., Boston, is the secretary of the association.

Industrial Drying Requirements.

An inquirer in *Lefax* asks: "We are confronted with a problem of drying the stock from which buttons are made. Would appreciate any information along this line and data on temperature and humidity."

The following answer was received from a *Calabur* member: "The following information may be helpful in solving the drying problem. Because the querist does not state what the buttons are made of, nor what system of drying is employed or contemplated, a direct answer cannot be given.

"Nature and mechanical means of drying both rely on warm, dry air in motion to absorb the moisture from material. Air with 50% humidity is considered dry. It contains only one-half the full amount of moisture it is capable of carrying. At a higher temperature the air can carry more moisture.

"Humidifiers or dehumidifiers may be necessary to give the desired amount of moisture in the air, or part of the used air, recirculated, may fill the conditions. For the heat requirements, direct radiation, warm air currents or a combination of the two, are used. Natural circulation is often depended on in warm air installations; fans are also employed. The temperatures required are different, depending on the nature of the product to be dried. In various operations, it is even necessary to vary the temperature during the drying period.

TABLE I. TEMPERATURE CONDITIONS FOR DRYING PROCESSES.

Material	Deg. F.
Apples	140-180
Bathing suits	120-180
Bedding	150-190
Blankets	140-180
Cereals	110-150
Feathers	150-180
Films, photo	90-110
Furs	150-190
Glue, bone and skin	70- 90
Hair goods	150-190
Hats, felt	140-180
Hats, ladies, glued	140-180
Hides, sole and thin leather	80- 90
Ink, printers	90-200
Knitted fabric	140-180
Macaroni	110-150
Matches	140-180
Nuts	90-140
Papers, treated	150-200
Pottery	110-120
Rags	120-180
Ribbons, pasted	160-200

Rope	120-180
Soap	80-100
Starch	180-200
Tapes, glued	160-200
Tobacco, leaf	70- 90
Tobacco, stem	170-200

The quantity of warm air for drying and its temperatures are the main factors. The practical ranges in temperature suitable for drying different products are given in Table I. The air supply required depends upon the rate at which the moisture is given up by the material. The air change frequency varies with every condition, the range being from 2 to 5 changes per minute in the drying chamber.

A rule-of-thumb for determining the volume of air required for a drying process allows 2½ changes of air per minute in the drying chamber. The temperature of this warm air supply to be considered as the highest value given in Table I, corresponding to the material that is to be dried.

A closer approximation of drying requirements may be arrived at with the aid of Table II. The figures give the quantity of air necessary at saturation to evaporate one pound of water at the corresponding temperatures of the air entering the drying chamber. These values are based on the theory that the air will leave the dryer completely saturated. In practice it is found that the air does not remove more than 50 to 70% of the moisture, and allowance should be made for same.

TABLE II. CUBIC FEET OF AIR AT SATURATION REQUIRED TO REMOVE 1 LB. OF MOISTURE WHEN THE AIR ENTERING HEATER IS AT 70 DEG., SATURATED OR HALF-SATURATED.

Temp. of warm air. Deg. Fahr.	Cubic feet required	
	Entering Air 100% Rel. Hum.	Entering Air 50% Rel. Hum.
80	8240	3300
90	4050	2380
100	2640	1845
110	1965	1515
120	1525	1270
130	1280	1085
140	1090	950
150	934	845
160	827	755
170	732	685
180	662	625
190	600	575
200	562	530

Assume a condition where rope has to be dried at a temperature of say 160° F. The drying chamber has a contents of 600 cu. ft. While wet, the rope weighs 350 lbs., and after being dried, the weight is 250 lbs., requiring that 100 lbs. of water be removed. With the air entering the heater saturated, 827 cu. ft. of air will be required per pound of water as in Table II, for 160° temperature. Then 100 lb. × 827 cu. ft. equals 82,700 cu. ft., which is the volume of air necessary for drying the rope. If it were required to complete the drying process in 120 minutes, then the warm air supply would have to be delivered at the rate of 689 cu. ft. per min. This gives a theoretical air frequency of 689 divided by 600 or 1.15 changes per minute.

In making allowance for a practical installation, it should be remembered that the air in absorbing the moisture from the rope will be only a little more than half saturated. On a 50% basis, therefore, the volume of air will have to be doubled if the time remain 120 min. or the time extended to 4 hours if the air volume remain as above.

NEW DEVICES

New Smokeless Type of Capitol Boiler.

A widespread curiosity on the part of the heating trade has been gratified in the publication of data regarding the new smokeless type of Capitol boiler, which has recently been placed on the market by the United States Radiator Corporation, Detroit, Mich. Unlike most smokeless boilers, this construction discards the downdraft principle. It is largely built according to the general recommendations for the construction of smokeless furnaces as made by D. T. Randall, of the Bureau of Mines.

1. The coal should be supplied to the furnace in small quantities at frequent intervals. The more nearly the feed approaches a continuous and uniform supply the better the results.

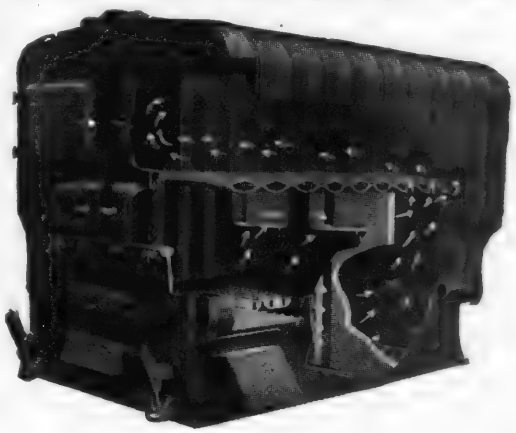
2. The air supply should be slightly in excess of the theoretical amount required and be admitted principally through the fuel bed, with an auxiliary supply admitted at the front or rear of the furnace to burn gases from the coal.

3. The temperature in the furnace should be sufficiently high to ignite the gases given off from the fuel bed.

4. There should be a fire-brick combustion chamber of sufficient dimensions and

so designed as to cause the thorough mixture of the gases and air, permitting complete combustion before the mixture reaches the boiler surfaces.

As will be noted from the illustration, this boiler contains a large fire-box or furnace where bituminous coal is burned at a rapid rate of combustion. The air is admitted principally through the grates and fuel bed, with an auxiliary supply admitted at the front of the furnace, which mixes with the volatile gases distilled from the fuel bed. These volatile gases pass from



CONSTRUCTION OF CAPITOL SMOKELESS BOILER.

the furnace into the mixing chamber through two horizontal openings at the top and in the back or bridge wall of the furnace. The mixing chamber back of the furnace is formed by the bridge wall at the front and an ignition wall of fire brick at the rear of the mixing chamber.

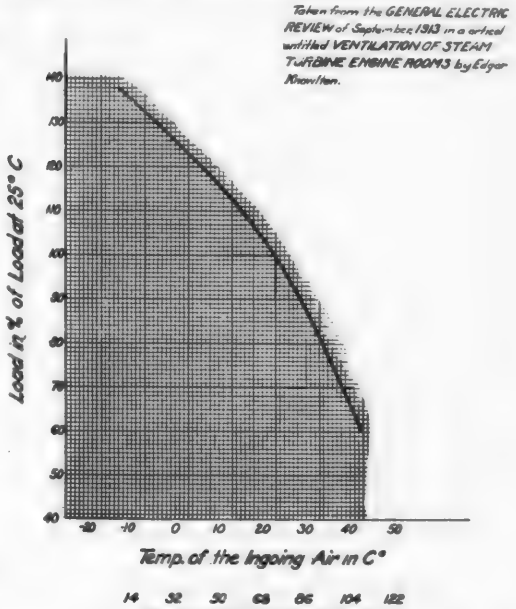
The passage of the gases from the mixing chamber to the combustion chamber at the rear of the boiler is through a long, vertical opening in the ignition wall, permitting a congestion and intermixture of burning gases, and their complete combustion in the combustion chamber. It is stated that the principle of complete combustion before the gases are cooled, as opposed to the downdraft principle, in which the cooling of the volatile gases begins at the upper or water grate, results in exceedingly high efficiencies.

Another advantage mentioned for this type of boiler is that no skilled attendance is necessary to obtain smokeless results. As the design provides for the complete combustion of the volatile matter in the boiler, there is no smoke to escape to the open air except during the time when the fire doors are open and coal is being fed to the boiler. It is stated that any of the bituminous coals may be used, including the lignites from the far West, at the same time complying with the requirements of any smoke ordinances of any city in the United States.

The Capitol smokeless boiler is made in five sizes for steam and sizes for hot water, with steam ratings running from 6,275 to 9,775 sq. ft. of direct radiation and water ratings from 10,000 to 15,650 sq. ft. The company has recently published a bulletin devoted to this boiler which gives full details, including tapping measurements and other data, including price lists.

Trade Literature.

SPRACO EQIPMENT, for washing and cooling air, especially applicable for steam turbine generators and other electrical machinery, is the subject of a carefully-compiled catalogue issued by the Spray Engineering Co., Boston, Mass. The fact that all modern electric



PERMISSIBLE LOAD ON A TURBO-ALTERNATOR AS A FUNCTION OF THE TEMPERATURE OF THE INGOING AIR.

generators are designed for a certain allowable maximum temperature in the armature and field windings makes some means for cooling them a matter of importance. With a given load, the temperature of a generator will be a fixed amount above the temperature of the ingoing ventilating air; therefore, the cooler the air delivered to the generator, the greater will be its capacity. The cleanliness of the air is also an important feature. The gain in capacity with cool air is worked out in the form of a chart giving the K.V.A. load

on turbo-alternators as a function of the entering air, and since the standard air temperature for electrical machinery is 25° C. (77° F.), 100% load is taken at this temperature. As an example, the temperature is assumed to be 90° F. (32.2° C.) with a relative humidity of 45%. The curve shows that with air at this temperature the safe capacity of the generator is only 87% of full load rating. If the air is passed through a Type B Spraco air washer and cooler, it may be reduced to a temperature of 74° F. (23.3° C.) or less, enabling the generator to carry 102½% load, resulting in a gain of approximately 15%, as the power required to operate the washer is but a fraction of 1% of the generator rating. The catalogue shows the different types of Spraco air washers, including typical installations. At the end is a list of 98 installations. Pp. Size 8 x 10¾ in. Pp. 16.

PROGRESS IN HOT WATER HEATING is the title of a revised and enlarged edition of a handbook devoted to the D. and T. tank-in-basement equipment, manufactured and sold by the D. & T. Mfg. Co., St. Louis, Mo. This system, primarily, is one for regulating the drafts on hot water heating boilers by means of the natural law of water expansion under increasing temperatures. The handbook goes on to describe the various devices used in this system including the D. and T. regulator, D. and T. air-sealed pressure controller and the D. and T. pressure gauge. Size 3¾in. x 6 in. Pp. 124.

VALVE WORLD for December, 1916, the monthly periodical of Crane Co., Chicago, contains, among other things, a readable article on "Des Moines, the City of Uncertainties." This issue closes the eleventh year in the life of the *Valve World*.

Organization of Braemer Air Conditioning Corporation.

Warren Webster & Co., Camden, N. J., announce that they have disposed of the business of their air conditioning department and on and after January 1, 1917, the Webster air conditioning apparatus will be manufactured and exploited by the Braemer Air Conditioning Corporation, Lafayette Building, Philadelphia, Pa. The new corporation has been formed by William R. Braemer, for many years manager of the air conditioning department of Warren Webster & Co. Besides conducting a general business in the manufacture and sale of air purifying apparatus, the new company will act as experts in air conditioning work in all its phases.

The best wishes of a wide circle of friends will accompany Mr. Braemer in his enlarged field of activity.

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TRADE AND MISCELLANEOUS NOTES

Coming Events.

May 9-10, 1917.—Annual meeting of the National Pipe and Supplies Association, in Philadelphia. Headquarters at the Bellevue-Stratford Hotel.

June 12-15, 1917.—Ninth annual convention of the National District Heating Association, in Detroit, Mich. Headquarters at the Hotel Pontchartrain. Secretary, D. L. Gaskill, Greenville, O.

Deaths.

William L. Kroeschell, secretary and treasurer of Kroeschell Bros. Co., Chicago, manufacturers of heating boilers, and heating and ventilating specialties, shot himself, November 23, at the Illinois Athletic Club. He died instantly. Mr. Kroeschell was sixty-one years old and was one of Chicago's successful business men. In addition to his connection with Kroeschell Bros. Co., he was secretary of Kroeschell Bros. Ice Machine Co. He leaves a widow, two daughters and one brother, Charles H. Kroeschell.

Arthur W. Magill, a Chicago representative of the Kewanee Boiler Co., Kewanee, Ill., died December 4, of heart trouble, after an illness of several months. He was fifty-nine years old. Mr. Magill was one of the founders of the United Bunch of Sheep of America, an organization of salesmen, and was well-known in the trade throughout the Middle West.

Richard W. Hauxwell, a member of the heating and plumbing firm of Hauxwell & Smith, Portchester, N. Y., died at his home in that place November 25. He was forty-five years old.

Announcement

Braemer Air Conditioning Corporation

takes pleasure in announcing that it has taken over the business and good will of the Air Conditioning Department of Warren Webster & Company, Camden, N. J., and will continue the manufacture of Webster Air Conditioning apparatus and Webster Air Washers, specializing in

Air Purifying—Cooling—High-Temperature Drying—Special Ventilating Systems for Industrial Plants—Humidifying—Dehumidifying—Low Temperature Drying—Automatic Humidity and Temperature Regulation

It will be the policy of the Braemer Air Conditioning Corporation to maintain the same high grade apparatus and engineering service as has been rendered by the Air Conditioning Department of Warren Webster and Company for the past nine years. Your inquiries are earnestly solicited and will be given prompt and careful attention.

Braemer Air Conditioning Corporation

LaFayette Bldg. PHILADELPHIA, PA.

Miscellaneous Notes.

Chicago, Ill.—"The latest for you to worry about," says the Chicago Evening American, "is the fresh air famine. Along with the coal famine and egg and meat famine you may now write in large letters in your high-cost-of-living list the name of the greatest confederate, 'oxygen starvation,' most costly of all because of its widespread injurious results." This comment is called forth by the experiments that are being conducted in the Chicago schools. Dr. Emily Noble, founder of the Twentieth Century Children's Crusade for Better Lung Development, is working with a class of forty-six pupils at the Chicago Normal College to show the inability of the school children to get the proper amount of air into their lungs and to prove the adaptability of her method of lung development for use in the public schools. At the Harper School, another series of experiments is being conducted with window ventilators which, it is stated, show the need of additional ventilation.

Patents have been granted a St. Louis inventor for an electric alarm that sounds when rain begins to fall in windows left open for ventilation.

Chicago, Ill.—An appropriation of $230,000 for the ventilation of Chicago's street cars has been made by the Chicago Surface Lines, following plans outlined by Health Commissioner Robertson. The work will involve changes on 2,200 cars.

Dayton, O.—In a letter addressed to the superintendents of the various street car companies in Dayton, Health Officer A. L. Light states that he recently investigated a number of street cars on all roads in the city. He found that the ventilators were not open, that there is practically no ventilation beyond that caused by the opening of the doors, that the mechanical ventilators are inadequate and that conductors apparently make no effort to properly ventilate these cars. He urges that at each end of the run, all doors and windows be thrown wide open and that at least two of the ventilating windows be opened in the severest weather and more opened in mild weather. In speaking on the general subject of street car ventilation, Dr. Light pointed out that the car companies are not altogether to blame, as in many instances the passengers are not properly dressed. If perspiring when they enter a car, the evaporation from the body is likely to be too rapid and they are conscious of the cold. If they find a ventilator open admitting fresh air, they immediately close it or call upon the conductor to get rid of the draft.

100% Efficient Heating Service

is assured if you install a

"RELIABLE" VACUUM OR VACU-VAPOR HEATING SYSTEM

HERE ARE A FEW REASONS WHY:

Even Heat Distribution, in zero or mild weather at any temperature desired.

Instant Results. Not necessary to wait until the cold air is forced out of the pipes and radiators, before heating begins.

Noiseless. No hissing radiators or hammering in the pipes.

No vapor escape.

No odors or gases.

No leaky Radiator Valves.

No adjustments necessary, as all attachments are permanently adjusted at the factory.

Great fuel Economy, because less steam pressure is required to operate system and maintain desired temperature.

Flexibility. The 3 styles of **"Reliable"** Systems—Air Line, Return Line and Vacu-Vapor—are equally efficient for large or small plants; and any style of building. Can be installed without changing piping of old systems.

These and many other advantages are thoroughly described in our "Reliable" Heating Catalog. Write for your free copy today, together with large charts showing typical layouts and styles of installation. Ask for Catalog "HV".

THE BISHOP-BABCOCK-BECKER CO. Cleveland, O.

Tacoma, Wash.—An effort is being made in Tacoma by the Parent-Teachers Association to replace the San ventilating system which is in use in five schools in the city with steam heating systems. Superintendent Geiger announced that during his visit East last summer he visited various up-to-date plants and just now is watching a series of experiments being conducted by the superintendent of schools in a wealthy suburb of New York, where money is available for trying out a number of methods, including the outdoor schools. "The experimenter," he stated, "after many months of careful study, has not yet concluded that the outdoor room is the thing. He does not commend the cheesecloth windows. He has also had much trouble with drafts from open windows and is leaning toward mechanical ventilating apparatus, but has not recommended a particular type."

San Diego, Cal.—A plan to use electric lights in flower beds to save the plants in cold weather is proposed by George G. Radcliff, superintendent of the capitol, where three large beds of chrysanthemums were recently killed by the frost. He proposes to install large electric lights in the chrysanthemum beds next season.

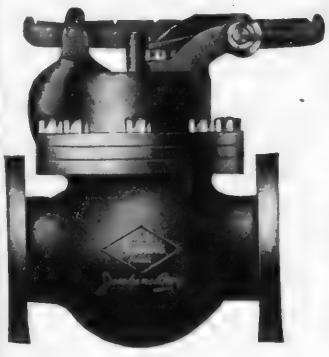
Charles K. Foster, vice-president and general manager of sales of the American Radiator Company, Chicago, has been elected a director of the Union Trust Company, of Chicago, to fill the vacancy caused by the death of James Longley, of Boston.

Detroit, Mich.—An amendment to the city ordinance licensing theatres has been submitted by Dr. William H. Price, health officer. The amendment provides that a certificate must be issued by the board of health to proprietors of moving picture houses before the mayor can grant a license. According to a recent survey of the board of health, 47% of Detroit's motion picture theatres are not properly ventilated and the proposed amendment is an effort to improve this situation.

New York.—"Sanitary Workshop Day" was one of the features of "Open Window Week" observed in New York recently. Under the plans of the health department of the city, special care was taken to keep shops well ventilated, in an effort to further the factory ventilation movement.

Lansing, Mich.—The State Board of Health is conducting free examinations for tuberculosis in the various cities in the State. Representatives of the department are preaching the open air school in every place they visit and are also urging additional ventilation in the present school buildings.

A further advance in the prices of boilers and radiators has been announced making present prices practically double those of the same period last year. The principal reason for the continued advance is the



For Exhaust Steam Turbine Work
USE THE
Jenkins Bros. Back Pressure Valves

with Piston and Air Cushion. They are the highest type of Back Pressure Valves made, are extremely sensitive, and work freely without the slightest jar or pounding. Their construction is such that a practically constant back pressure is maintained under a wide variation of load. They are made with lever and ball, as shown in the cut, or with wheel, chain and weight.

Jenkins Bros.

New York Boston Philadelphia Chicago

SPECIFY — FOXBORO TRADE MARK — INSTRUMENTS

TO INDICATE or RECORD TEMPERATURES and PRESSURE

They have a distinctive quality with a fineness of mechanical detail which insures Accuracy and Durability under the hardest Service

THE FOXBORO COMPANY, FOXBORO, MASS.

New York Chicago St. Louis Birmingham, Ala. San Francisco

price of pig iron for future delivery, which is 50% above the price paid a year ago.

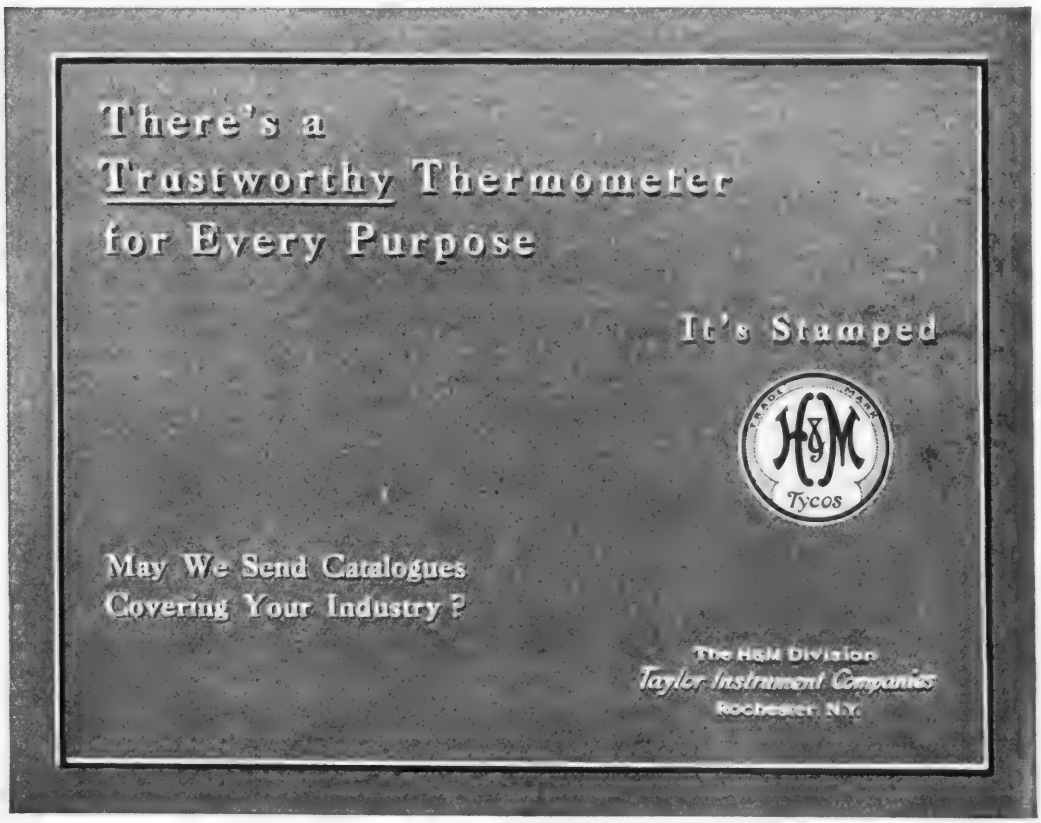
Cleveland, O.—According to the will of Frank E. Cudell, of Cleveland, whose death was announced last month, his drain trap manufacturing business has been bequeathed to the City of Cleveland.

L. O. Koven, who recently retired as president of the Eastern Supply Association, has been elected president of the National Committee of the Confederated Supply Associations, this action being taken at the meeting of the committee, November 16. He succeeds J. J. Ryan who has served as president nine years. The other officers are: Vice-president, W. A. Myler, Pittsburgh; treasurer, F. W. Hubbard, Boston; secretary, Frank S. Hanley, 261 Broadway, New York; directors, L. O. Koven, W. A. Myler, F. W. Hubbard, D. L. Hamill, F. D. Keeler and J. J. Ryan.

Cleveland, O.—The annual banquet of the Cleveland Master Steam and Hot Water Fitters was held at the Hofbrau, Cleveland, December 18.

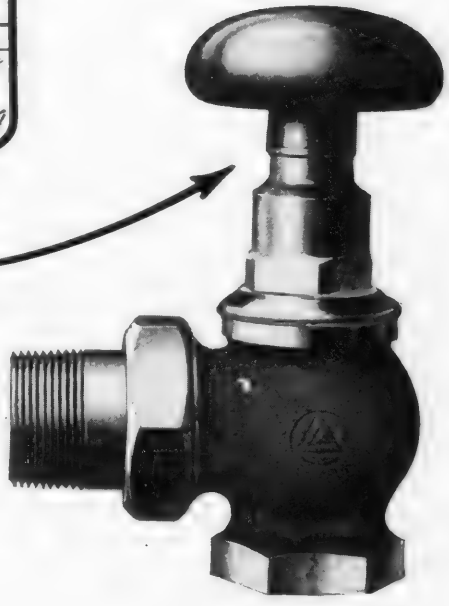
Building Operations for November, 1916, closely approximated the figures for the same period last year. The total for 109 cities, as compiled by The American Contractor, Chicago, was $69,268,617, as compared with $68,465,791, for November, 1915, an increase of 1%. Notable gains were made by Baltimore, 36%; Buffalo, 16%; Canton, 84%; Des Moines, 61%; Detroit, 64%; Erie, Pa., 86%; Indianapolis, 64%; Kansas City, 26%; Los Angeles, 50%; Louisville, 60%; Milwaukee, 167%; Newark, 100%; Oklahoma City, 107%; Philadelphia, 93%; Pittsburgh, 38%; Richmond, 73%; St. Louis, 59%; St. Paul, 39%; Tacoma, 277%; Washington, D. C., 157%; Worcester, Mass., 50%; and Youngstown, O., 32%. The important losses were those in Atlantic City, 48%; Boston, 32%; Chicago, 7%; Evansville, 68%; Grand Rapids, 45%; Hartford, 28%; Minneapolis, 39%; New Haven, 52%; New York City, 36%; ($8,950,279 from $14.041,210); Oakland, Cal., 38%; Peoria, 33%; Rochester, N. Y., 27%; Seattle, 40%; Sioux City, 44%.

Valve manufacturers met in conference, November 21, at the Hotel Gibson, Cleveland, Ohio, to discuss a number of trade matters including the expansion of business in South America. The following concerns were represented at the conference: Kennedy Valve Mfg. Co., Elmira, N. Y.,



DETROIT PACKLESS RADIATOR VALVES

The Packless Valve
ELIMINATES
DISSATISFACTION



Detroit Packless Valves give perfect satisfaction to both tenants and owners. A valve that always stays tight—can't leak.

Specify Genuine Detroit Packless Valves

DETROIT LUBRICATOR COMPANY
DETROIT, U. S. A.
CANADIAN DETROIT LUBRICATOR COMPANY, LTD. WALKERVILLE, ONTARIO.

LARGEST MANUFACTURERS OF RADIATOR VALVES IN THE WORLD

the Pratt & Cady Co., Hartford, Conn.; Chapman Valve Co., Indian Orchard, Mass.; Norwood Engineering Co., Boston; Darling Pump & Valve Mfg. Co., Williamstown, Pa.; Rensselaer Valve Co., Troy, N. Y.; Flower-Stephens Mfg. Co., Detroit, Mich.; Ludlow Valve Mfg. Co., Troy, N. Y.; Columbian Iron Works, Chattanooga, Tenn.; Iowa Valve Co., Oskaloosa, Iowa; Glamorgan Pipe & Foundry Co., Lynchburg, Va., and the Bourbon Copper & Brass Works, Cincinnati.

National Association of Master Plumbers will make a number of changes in its by-laws to enable the association to conform to government requirements, if the report of a special committee which has been at work on the subject is adopted. It has already been passed upon favorably by the board of directors. The proposed changes refer principally to the declarations of purpose which, it has been held, are at present in conflict with the Sherman anti-trust law. In its report the committee states: As is now well known, the Des Moines trials were adverse to the defendant plumbers and an appeal was taken to the United States Circuit Court of Appeals. During the progress of the trial of the Salt Lake City cases the Court of Appeals de-

HOTEL TRAYMORE
ATLANTIC CITY, N.J.

November 28, 1916.

Ilg Electric Ventilator Company,
327 Commercial Trust Building,
Philadelphia, Pennsylvania. Attention of Mr. C. A. Anderson.

Dear Sir:

In reply to yours of November 24th, concerning service which we have received from Ilg fans, beg to state that we have several of them in operation, all direct connected motor driven, and that they are giving perfect satisfaction. We wish to take this opportunity of expressing our appreciation of the well built commutators of your armatures, as we have fans that have been in operation about sixteen months and the commutators are practically unworn. When we compare these with other motors of first-class make on which we have turned down the commutators once or twice in the same period of time, it makes us feel that there must be particularly good material and workmanship in your product.

Yours very truly,

GBC/MK. HOTEL TRAYMORE,
SUPT OF PROPERTIES

SEE WHAT THE
LARGEST RESORT HOTEL IN THE WORLD
SAYS ABOUT
ILG Universal Blowers and ILG Self-cooled Motor Propeller Fans
This installation includes 6 direct connected Universal Blowers, sizes 45″ to 90″, and 10 Self-cooled Motor Propeller Fans.
ILG ELECTRIC VENTILATING CO., 158 Whiting St., Chicago

Architect, Francis S. Swales, Vancouver, B. C.

New Vancouver Hotel, Vancouver, Canada

NEW VANCOUVER HOTEL HAS

Sturtevant Apparatus

(REG. U. S. PAT. OFF.)

In the new Vancouver Hotel there are in all nine Sturtevant Propeller and Multivane Fans, all driven by Sturtevant Direct-Current Motors.

In addition to the fans there are three Sturtevant Type H Air Washers.

Recent catalogs have been published on Sturtevant apparatus and these will be sent on request.

Catalog 226-V—Air Washers
Catalog 230-V—Heaters

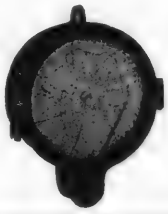
B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON MASSACHUSETTS

And All Principal Cities of the World

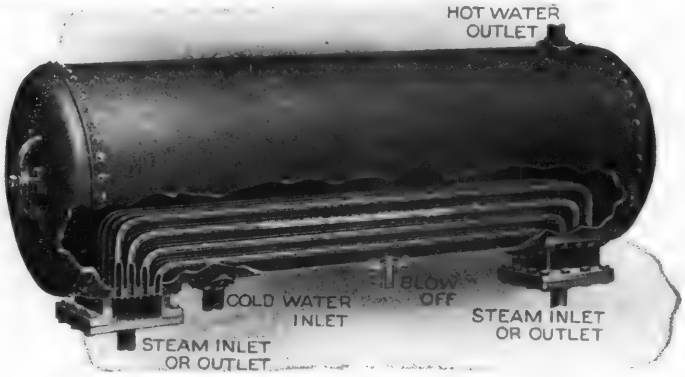
cided the Des Moines cases against the master plumbers on all points. This, of course, had a very adverse effect in the Salt Lake City cases, which were terminated by a second complete defeat. There remain to be disposed of the Erie, Pa., cases, and negotiations are under way whereby it is hoped to close those cases upon a plea without a trial. The committee considers the action of the court of appeals in the Des Moines case as decisive on some of the most important issues in these trials and the association must, therefore, conform to its dictates. In addition to the changes in the by-laws, the committee recommends a formal and complete abrogation and repeal of all of the early resolutions condemned by the court of appeals. It is proposed to abolish the office of national State vice-president. Regarding executive sessions, it is proposed to abolish these. On this point the committee states: "it is believed that the real purpose of executive sessions has been to dispose rapidly of a great accumulation of work, to shut off useless and purposeless discussion, and to provide a time, divided from the general running discussion, in which to do the routine work of the meetings. However, in every litigated case these executive sessions have been magnified into great secret conspiracies, sometimes by supply houses and sometimes by governmental agencies. That there may be no doubt of the purpose of this association to conduct its business openly it is proposed to abolish executive sessions, and so enlarge and rearrange the committees work

Your Choice of Seven Types
is offered in our line of
Standard Recording Thermometers
We make a specialty of hot water and steam indicators
Send for Catalogue VH
Standard Thermometer Co., Clifton and Shirley Sts., Boston, Mass.



THE ⌐¬ SHAPE TUBES EXPLAIN THE SUCCESS
of the
PATTERSON HOT WATER TANK

for heating water for domestic or manufacturing purposes. Both ends of each seamless brass tube are expanded into heavy cast-iron tube-heads with an improved roller expander. Their shape provides for the free contraction and expansion of each individual tube without straining, so there is no danger of leakage.

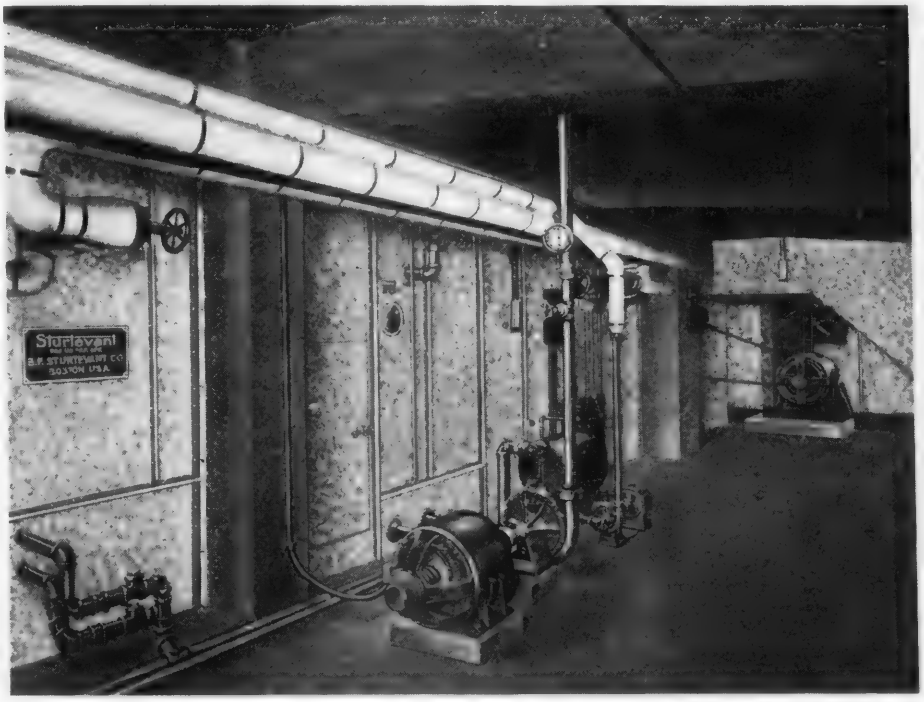


Type C. Patented Aug. 26, 1913.

Any Combination of Storage and Heating Capacities can be Furnished.
Send for Catalogue.

FRANK PATTERSON & CO., 26 Cortlandt Street, New York
Representatives in all Principal Cities.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*



Sturtevant Air Washer, Fan and Heating Apparatus in Windsor Theatre, Chicago, Ill. Engineers and Contractors, Phillips Getschow Co.

Another Chicago Theatre Has

Sturtevant Air Washers

(REG. U.S. PAT. OFF.)

The Windsor Theatre in Chicago located on Clark Street near Division has Sturtevant Heating and Ventilating Apparatus.

Other recent air washer contracts include:

Cleveland City Hall
Parkway Central Building, Philadelphia
Dormitory, Wellesley College
Miami Hotel, Dayton, Ohio
Buck & Raynor Building, Chicago
Deshler Hotel, Columbus
Detroit Post Office
Bank of Italy, Los Angeles, Cal.
Frankfort High School, Philadelphia
East Ohio Gas Company Building, Cleveland
Rochester No. 17 School

Our Air Washer Department will co-operate with engineers on all problems of Heating, Ventilating and Air Conditioning.

Send for Bulletin 226-V or a copy of specifications

B. F. STURTEVANT COMPANY,

Hyde Park, Boston, Massachusetts

And All Principal Cities of the World.

that the business at meetings can be disposed of promptly and still allow free discussion of problems on the floor of the convention."

Charleston, W. Va.—In accordance with a compromise between the Manufacturers' Light and Heat Company and its patrons who protested when the company applied over three years ago to the Public Service Commission for permission to advance its rates, the advance in rates will stand with certain exceptions. The light and heat company pays all costs of litigation in the United States Courts, and returns to the commission such part of costs as has been advanced by the commission, not to exceed $3,000, which includes costs paid to stenographers. Each party to the suit will pay its own stenographers. The cost of this litigation is said to have exceeded $200,000.

National Complete Building Exposition, which is to be held at the Grand Central Palace, New York, March 5-11, 1917 will offer manufacturers of heating apparatus using coal for fuel an opportunity to display their products to advantage, if the present plans of the exposition are carried out. One entire section of the main floor has been set aside for the display of heating and ventilating systems. Gas-using heating systems will also be represented in the exhibits.

Central Station Heating Notes.

Tacoma, Wash.—The franchise of the Tacoma District Heating Co., which was recently organized with a capital stock of $100,000, and which took over the franchise from a Seattle concern, calls for an investment of at least $25,000 in a steam heating plant by July 1, 1917. The company expected to have in operation a 1,000 H.P. steam heating plant for heating the downtown section of the city by January 1.

Chicago.—The Indiana Power and Water Company has purchased the power plants at Worthington, Bloomfield, Elnora, Odon and Bicknell, Ind., and is consolidating these various properties for the purpose of supplying light, heat, power and water to the surrounding territory from a central plant.

Des Moines, Ia.—The retail merchants' bureau is taking an active part in reviving the agitation for a central stating heating franchise for the Des Moines Electric Company. Secretary C. W. Judd stated recently that "when we decide upon the kind of franchise we want we will induce the electric company to make a campaign for it."

Look At This Wheel!

Patented May 26, 1903

The Blades are set at an angle to the shaft.

Various tests have proven that this fan—

1st—Handles More Air
2nd—Requires Less Power

than any Multivane Fan with blades set parallel with the shaft.

IT'S A

CYCLOIDAL MULTIVANE

SEND FOR OUR NEW CATALOGUE No. 160

GARDEN CITY FAN CO.

L. J. Wing Mfg. Co.
352 W. 13th Street
New York City

Established 1879
McCormick Bldg.
CHICAGO, ILL.

H. Mishler Co.
Penobscot Bldg.
Detroit, Mich.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

The New "Siroccofied" Building of the Detroit Trust Company

Albert Kahn, Architect
Ernest Wilby, Associate
Detroit

E. E. Harris,
Engineer
Detroit

A MILLION DOLLAR INSTITUTION with a directorate and personnel which not only can have, but demands, the finest, most efficient housing.

A really remarkable building for an institution which is great even among our great American institutions of finance.

The very selection of the appliances and equipment of such captains as these tells a far greater story of merit than could be told in words of any kind. And by reason of the same facts, these things must be the safest of guides in purchasing and specifying.

AMERICAN BLOWER COMPANY

DETROIT, MICHIGAN

BRANCHES EVERYWHERE

Manufacturers' Notes.

H. W. Johns-Manville Co., New York, on account of "the very satisfactory earnings of the company in 1916 and the splendid service rendered by the J-M employees," announced that every employee who has been with the company a year or more has received a bonus equal to 10% of the year's salary. The bonus was accompanied by a Christmas card of greeting, signed by President T. F. Manville.

Columbian Hardware Co., Cleveland, O., has appointed D. J. Metzger manager of the company's register department. Mr. Metzger has been connected with the heating and ventilating field for sixteen years.

Holland Furnace Co., Holland, Mich., has increased its capital stock from $250.000 to $650 000. Contractors have practically completed the large foundry addition to the company's plant.

Kewanee Boiler Co., Kewanee, Ill., granted a Christmas bonus of 10% of salaries to all of its employees.

Consolidated Car Heating Co., Albany, N. Y., announces the resignation of Cornell S. Hawley as president of the company. He is succeeded by Claude C. Nuckols, vice-president and general manager. Mr. Hawley becomes treasurer of the Remington Arms Co., Bridgeport, Conn.

Syracuse Faucet & Valve Co., Syracuse, N. Y., is the subject of a special sketch in the proclamation edition of the "Commerce of Greater Syracuse," recently published. A history of the company is given from its inception in 1901 and the illustrations include a photograph of Joseph F. Brightman, general manager of the company.

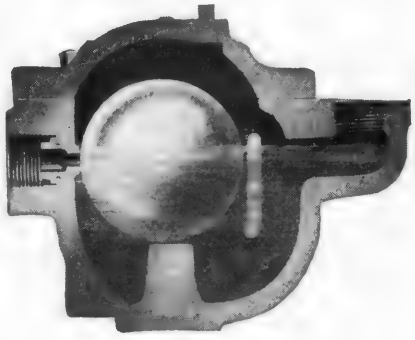
Ilg Electric Ventilating Co., Chicago, Ill., announces that branch offices of the company have recently been established in a number of the smaller cities, making the company's complete line-up of branches as follows: New York, Philadelphia, Cleveland, Pittsburgh, Boston, Detroit, Cincinnati, Indianapolis, Buffalo, Milwaukee, St. Louis, Omaha, Kansas City, Topeka and Duluth. These branches are all in charge of capable engineering salesmen, states the company, making it possible to give personal service to architects and engineers in all the large centers. The company which manufactures the well-known Ilg line of fans, blowers and exhausters, also announces an increase in its capital stock to $350,000, consisting of $100,000 preferred and $200,000 common stock. The increase in capitalization is a direct result of the

Judge this J-M trap by what it does

Perhaps to the uninitiated the J-M Steam Trap looks "too good to be true." Yet its simplicity is due to a correct and ingenious application of physical laws.

It consists of but three parts—body, ball and discharge bushing. The ball is held by steam pressure against the discharge orifice until condensate accumulates. Then, it is rolled upward by its buoyancy. All or part of the outlet area is thus exposed, and water and air discharge continuously until the water level falls, when the ball drops to its first position, preventing loss of steam.

The J-M Steam Trap is long past the experimental stage, as evidenced by its wide acceptance. Nearest J-M Branch will supply details.



JOHNS-MANVILLE SERVICE COVERS THE CONTINENT

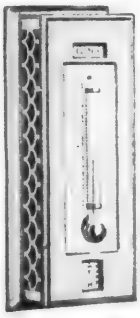
H. W. JOHNS-MANVILLE COMPANY
New York City

Branches in 54 Large Cities

FIRST IN THE FIELD

Automatic Temperature Control for Buildings Originated with the

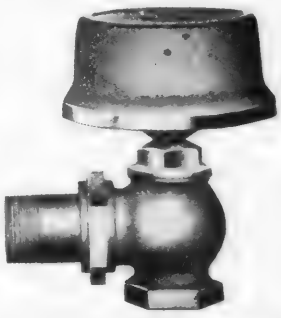
Johnson System of Temperature Regulation



The marvelous little fool-proof Thermostat

While various imitations in the way of regulating devices have been offered to the heating trade, the JOHNSON SYSTEM is the recognized standard.

It costs no more to install the JOHNSON SYSTEM than inferior products, so why assume any risks?

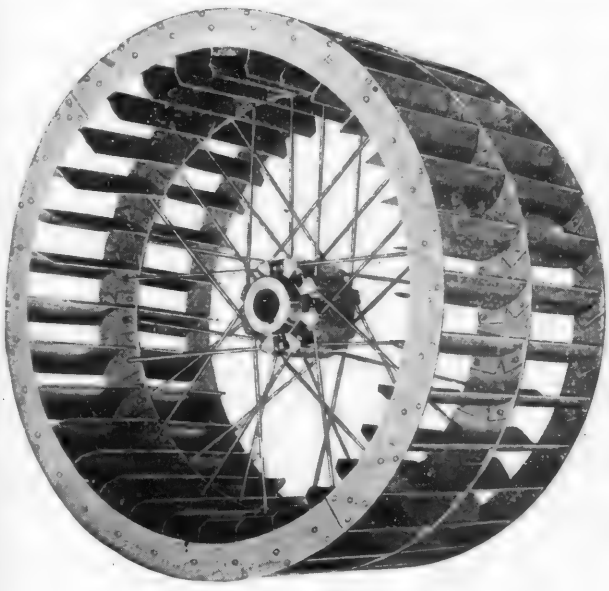


The indestructible [illegible] metal diaphragm valve

Communicate with our nearest branch in regard to your temperature regulation requirements Our co-operation is yours for the asking. You can reach us overnight.

THE JOHNSON SERVICE COMPANY

MILWAUKEE, WIS.



For Heating, Ventilating, Drying and Mechanical Draft Purposes

use the

PLEXIFORM FAN

because of its high efficiency, great strength, lightness and low cost of installation.

Plexiform wheel construction is as a aptable for double width as for single width fans, and is the only type of multiple blade wheel fan that is equally adaptable for high or low pressures without change in design and construction.

We have Fans of standard Plexiform construction handling air at – 50 deg. and gases at 1,000 deg. temperature.

Write for catalogs.

BAYLEY MANUFACTURING CO., Milwaukee, Wis.

company's growth which has made it necessary to build a second, new addition to the factory, fronting on Wells Street. The new addition will house the forge shop and the heavy punchings and notching presses used in the manufacture of Ilg motors.

Business Troubles.

P. J. Sullivan Co., Boston, Mass., has filed a petition in bankruptcy, with liabilities of $63,731 and assets estimated at $22,160. There are about 230 unsecured creditors.

New Incorporations.

C. A. Bruhns, Inc., New York, capital $15,000, to conduct a realty and heating and plumbing supply business. Incorporators: M. A. Coyle, W. C. Bruhns and C. A. Bruhns, 152 Amsterdam Ave.

Bernhard Boiler Co., Boston, Mass., capital $25,000. Incorporators: Frederick N. Le Baron, W. Newton, L. S. Le Baron and G. L. Le Baron.

Steel Ventilouvre Co. of America, New York, capital $500,000, to manufacture ventilators, transoms, etc. Incorporators: J. P. Goodhart, W. C. Lange and C. M. Wills, 25 West 42nd St.

Compound Heater Mfg. Co., Long Island City, N. Y., capital $50,000, to manufacture heating specialties. Incorporators. E. T. Koch, E. Fisher and W. E. Fisher, all of 67 Sixth St., Long Island City.

Dumore Heating and Ventilating Co., St. Louis, Mo., capital $50,000 to do contracting work. Incorporators: George A. Deemar, Henry V. Deemar, Michael Jerca, John W. Leimberger and John W. Marx.

American Supply Co., St. Paul, Minn., capital $50,000, to deal in heating and plumbing supplies. Incorporators: Fred J. Camitsch, Frank H. Merrill, A. Zurn and Joel E. Gregory, all of St. Paul.

Waukoria Mfg. Co., Wilmington, Del., capital $10,000, to manufacture heating and ventilating specialties.

Munkenbeck Bros., Inc., Brooklyn, N. Y., capital $10,000, to manufacture heating and plumbing specialties. Incorporators: F. A. C. Munkenbeck and T. T. Munkenbeck, 88 Hamilton Avenue, Brooklyn.

General Plumbing & Supply Co., Martinsville, Ind., capital $10,000, to deal in heating and plumbing supplies. Directors: Walter A. Kennedy, Robert H. Egbert, E. S. Kriner and L. H. Prath.

The Proof is So Easy—
Ask Our Representative

THIS is the interesting and convincing minister of **"The Gospel of Fresh Air"** which will enable you to grasp at a glance the certainty and economy of Semi-Mechanical Ventilation.

A post-card request will bring a catalog or a demonstration.

The Ohio Blower Co.
5124 Perkins Avenue
Cleveland, Ohio

SWARTWOUT
Rotary Ball-Bearing Ventilators

Sturtevant
(REG. U.S. PAT. OFF.)
Autoforce Ventilator

is unique in that it uses wind pressure to create a positive, powerful suction that draws air from the building. It operates on the same successful principle as the steam injector and the Hancock inspirator.

It will remove three times as much air as any stationary ventilator of the same size, and twice as much as other ventilators of the swinging cowl type. A small Autoforce will do the same work as any other ventilator several times as large.

This means much less cost to handle the same amount of air.

FULL INFORMATION ON REQUEST

B. F. STURTEVANT COMPANY, Hyde Park, Boston, Mass.
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No Better Valve

The qualities which in 1906 made LAVIGNE PACKLESS QUICK-OPENING STEAM RADIATOR VALVES pre-eminent in the field of steam and vapor-vacuum heating are still embodied in the valve as it is produced today.

Year after year has seen a steady refinement of detail until now we feel extremely proud of our manufacture.

The design as it was originally conceived has proven thoroughly reliable and well adapted for its work but niceties of finish and manufacture have been perfected and instituted to such a degree that we feel justified in claiming that

Wood Wheel Packless Valve

There is No Better Valve Than The Lavigne Packless Quick-Opening Steam Radiator Valve

The valve is recommended to discriminating users for these fundamental features;—

R. H. Corner Packless Valve

It positively does not leak air, water or steam.

It opens quickly and closes quickly.

It is built on honor throughout.

IT IS BUILT RIGHT—TO STAY TIGHT.

It is a beautiful, well balanced, handsomely finished valve.

It is at once an ornament and a necessity on every good job.

Made in six sizes—many styles—Ask your jobber for details.

Lavigne Manufacturing Company

Detroit, Mich.

Contracts Awarded.

Powers Heating and Ventilating Co., Boston, Mass., installing new boiler plant and central heating plant for the West Department of the City Hospital.

Johnson & Morris, New York, heating $300,000 loft and service building for A. M. Napier & Co., Greenwich and Veseys Sts., New York.

G. F. Higgins & Co., Pittsburgh, Pa., heating and ventilating new George Westinghouse High School for $122,206. The plumbing contract went to the Buerkle Plumbing Co., at its bid of $89,920.

Gillis & Geoghegan, New York, heating loft building for Vincent Astor at 102-108 West 19th St., New York.

Bryce Heating & Ventilating Co., Toledo, O., heating and ventilating high school at Birmingham, Mich., for $23,000; also heating and ventilating high school at Plymouth, Mich., for $17,000; high school at Marion, O., for $17,000 and the State Normal College at Bowling Green, Ky.

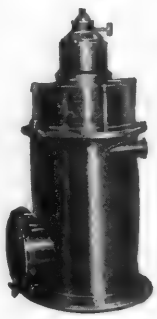
J. J. Hurley, Boston, Mass., heating and ventilating new junior high school at Somerville, for $10,274.

MacMahon Plumbing & Heating Co., Kansas City, Mo., heating and plumbing Sinclair Oil and Gas Building, at Tulsa, Okla., for $35,000.

Rhodes & Troyer, Logansport, Ind., heating and plumbing Monticello Thread Mills at Monticello, operated by Marshall Field & Co., for $15,000.

W. R. Renny, Grants Pass, Ore., heating and plumbing Josephine County Court House, for $7,057. Other bids were: heating, T. M. Barr, Portland, $3,300; Kendall Heating Co., Portland, $4,178; Finnegan Bros. Portland, $3,964.

R. Gildea Syracuse, N. Y., heating and ventilating Potsdam Normal School, at Potsdam, N. Y., for $30,000. Bradley &



¾ H.P. Equipment

Spencer Turbine Vacuum Cleaners

are manufactured in sizes from ¾ H. P. to 40 H. P.

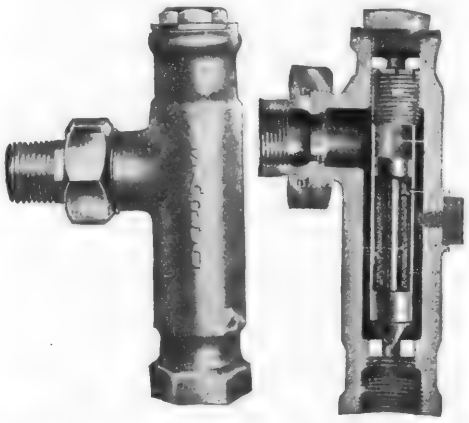
Send for catalogue

SPENCER TURBINE CLEANER COMPANY

HARTFORD, CT.

FORGET YOUR TROUBLES By Using

The Efficient, Reliable and Sensibly Constructed



RADIATOR TRAP

SARCO

Its construction is simply an iron case, having a Sarco cartridge filled with oil, valve seat, lock nut and cap. Absolutely nothing in construction to get out of order and cause trouble and repair expense.

The moment steam comes in contact with cartridge, the oil expands, closing trap—condensation forming creates a contraction opening trap. Positively no chance of water hammer or air binding, and will maintain a perfect vacuum in radiator.

Send for special Trial Offer.

SARCO CO., Inc.

Woolworth Building, New York

THERE are two types of buildings in Cleveland, Ohio, one an office building, the other a department store. Both are ventilated with equipment driven by

Westinghouse Motors

Westinghouse Motors are successfully driving ventilating equipment in all types of buildings—everywhere.

Our engineers will be glad to assist in drawing the specifications for your next job.

Westinghouse Electric & Mfg. Co.

Sales Offices in all Large American Cities. East Pittsburgh, Pa.

FOUL ODORS

Eliminated

and the Air kept Pleasant and

Wholesome

by

Sprague Electric Ozonators

Combination Ozonator and Electric Fan

Can be used also as an adjunct to ventilating systems

Low Cost of Maintenance

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SPRAGUE ELECTRIC WORKS

of General Electric Company

Main Offices

527-531 W. 34th Street New York, N. Y.

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OPEN TERRITORY

There is still good open territory in many sections of the United States that can be obtained by the right kind of representatives covering the resale of

Connersville Vacuum Cleaners

Licensed under KENNEY PATENT 847947

Sanitary conditions of cleanliness are constantly being demanded in a greater degree by all society thru their laws. This will result in a most certain growth of business for all establishments that get into the game while it is young.

UNITED VACUUM APPLIANCE CO.

CONNERSVILLE, INDIANA

Weed, New York, are the general contractors.

L. W. Pomerene Co., Lincoln, Neb., heating and plumbing David City high school for $21,000.

F. W. Spencer & Co., Salt Lake City, Utah, heating and ventilating Liberty School, in Salt Lake City, for $9,998.

Business Chances.

Clinton, Mass.—A proposition to build a central heating plant in Clinton to care for all of the public buildings in the center of the town is under consideration by the town officials.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until January 19, 1917, for the construction complete of the U. S. Post Office at Charlotte, Mich.

Until Janury 22, 1917, for the construction complete of the U. S. Post Office at Richfield, Utah.

Drawings and specifications may be obtained from the custodians on the sites or from the office of the Supervising Architect, James A. Wetmore.

Wanted.

Position Wanted.—Superintendent of power, heating and ventilating plants and district heating plants; sales engineer of steam power machinery and heating and ventilating apparatus; expert on design and installation, now employed, is open for an engagement after January 15, 1917. Address Superintendent, care of Heating and Ventilating Magazine.

Wanted—Engineering draftsman, capable of estimating and designing heating and ventilating and power plants. Address, giving all particulars, salary, etc., Gorman, care of Heating and Ventilating Magazine.

According to Charles P. Steinmetz, the well-known electric expert, "electricity will become so universally used that the housewife will wash dishes and clothes, cook the dinner, heat the house and even sweep the floor electrically. In a few years huge generating plants, besides supplying city homes, will carry current to every home within a radius of fifty miles."

Single Pipe Type

Natural Air

Are you planning to give your clients a natural air condition during the heating season?

Not psychological but real humidity may be had under all conditions by using

STEAMO and VAPO AIR MOISTENERS

Tests have shown that the cost of the best evaporating device is 11 times greater for the same quantity of moisture than that of the Steamo Air Moistener.

Send for new catalogue.

The Air Moistener Co.
28 N. Market St.
Chicago, Ill.

Sturtevant
REG. U. S. PAT. OFF.

Electric Heat Blower

Solves the problem of the small heating unit

The Sturtevant set consists of a motor-driven Multivane Fan discharging air through heating coils placed in an aluminum casing. The inside of the casing acts as a diffuser—Set can be used with or without heating coils.

Send for Bulletin 219-V

B. F. STURTEVANT COMPANY
Hyde Park, Boston, Massachusetts
And all Principal Cities of the World

An Efficient and Economical Heating System

The WEBSTER System is a method of circulating exhaust steam, live steam, or a combination of the two, to obtain not only the utmost efficiency but the greatest economy.

The WEBSTER System has been installed in over 10,000 buildings during the past 29 years. This record has been achieved only by giving uniformly successful results.

Webster

VACUUM SYSTEM OF STEAM HEATING

is adapted to the heating problems of a single building or an extended group of buildings, and overcomes excessive coal bills, nerve-racking "water-hammering," odor, air binding, etc. The circulation of steam is secured with little or no back pressure. The WEBSTER Modulation Valves control the temperature in each room. The WEBSTER Sylphon Traps automatically discharge all air and condensation from radiators and pipe coils.

Let us explain to you how the WEBSTER System will reduce your coal bills, and prove a most thoroughly reliable, efficient and economical heating system. We offer you our complete co-operation, either direct or through your architect, consulting engineer, or heating contractor. Our interest in the complete success of the WEBSTER System is equal to your own, and we back this statement up with our guarantee.

Write us today for complete information. Ask for Catalogue V-37

WARREN WEBSTER & COMPANY

Manufacturers of Webster Systems of Steam Heating, Webster Feed Water Heaters, Webster-Lea Heater-Meters, Webster Steam and Oil Separators, Webster Steam Specialties

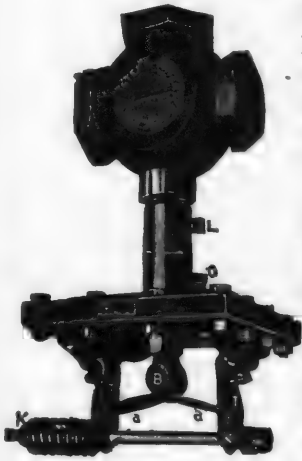
MAIN OFFICE AND WORKS — CAMDEN, NEW JERSEY — POINT AND PEARL STS.

ESTABLISHED 1888 — BRANCH OFFICES IN PRINCIPAL CITIES

For Safety, Sureness of Operation and Durability

FOSTER PRESSURE REGULATORS

for STEAM HEATING SERVICE



(Classes "Q" and "Q H") lead the way. Designed especially for steam heating, and suitable for vacuum systems, for delivery pressure of from 1 to 15 lbs.

We make several types of pressure regulators—those shown in the illustrations here were designed particularly for steam heating service, and they are very sensitive, reliable, high grade in every particular and superior to other makes in construction and workmanship. there are no weights or close fitting pistons, and are easily adjusted to the desired pressure between 1 and 15 lbs. Made in sizes ¾ inch to 2 inches inclusive, composition body. Larger sizes are fitted with composition renewable seats.

Class "Q" Class "Q H"

These Valves are fully explained on Pages 29 to 33 of our General Catalogue, No. 20.

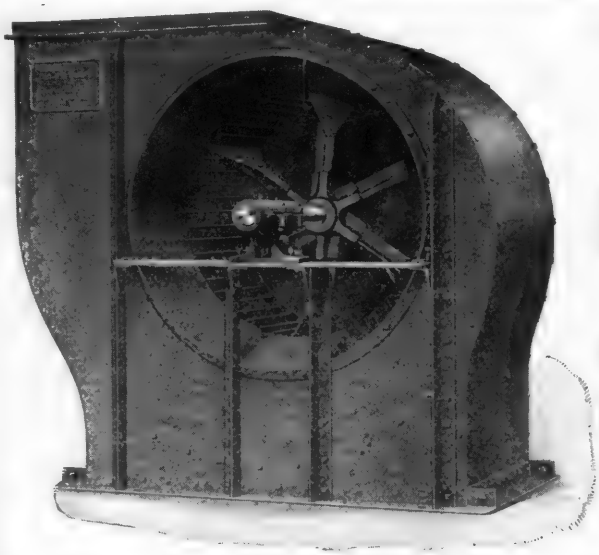
FOSTER ENGINEERING CO., Newark, N. J.

CHICAGO, ILL., 189 North Dearborn Street — PHILADELPHIA, PA., 601 Harrison Building

PITTSBURGH, PA., 518 Park Building — BOSTON, MASS., 161 Summer Street

Consolidated Engineering Company

Successors to MASSACHUSETTS FAN COMPANY



We can make immediate and

PROMPT DELIVERIES

Manufacturers of the

Massachusetts Squirrel Cage Fans (Modified Type)

Massachusetts Davidson Propeller Fans

Specified and used by the leading Architects and Engineers

Offices: Chicago, New York, Boston, St. Louis, Atlanta, and all principal cities
Factories: Chicago and Watertown, Mass.

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A PUMP FOR EVERY PURPOSE

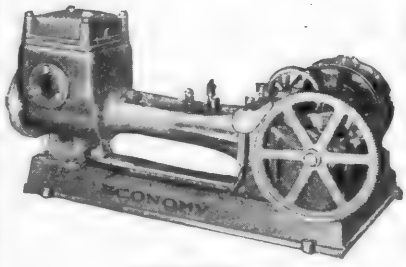

Figure 2149
Economy Motor Driven, Direct Acting Vacuum Pump, Double Acting Type

Automatic Bilge Pumps
Sewage Ejectors and Cellar Drainers
Automatic Condensation Pumps and Receivers
Vacuum Pumps, for two pipe or air line systems—automatic, electric or hand control
Automatic House Pumps and Compression Water Systems

ECONOMY PUMPING MACHINERY CO.
116-118 N. Carpenter St., Chicago
Phones—Monroe 5941-5942

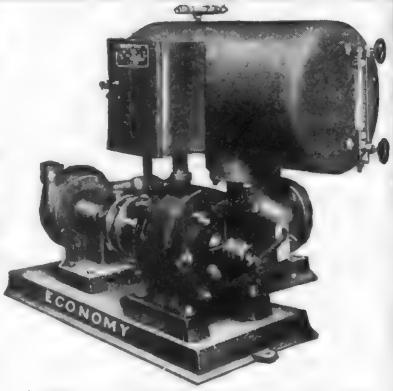

Figure 2129—Economy Automatic Condensation Pump and Receiver for low water lines and underground returns.

TABLES FOR VENTILATING DUCTS

By C. E. PEARCE, M. E.

A set of six tables printed on heavy bristol board. Size 7 x 9 inches. Wire hanger attached. Handy for shop or drafting room.

These tables are simple and practical, and present the best short-cut method for figuring sizes of Ventilating Ducts.

Price, postpaid, 50c.

Address Heating and Ventilating Magazine, 1123 Broadway, New York

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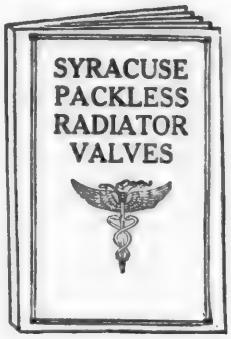
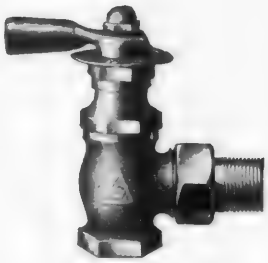


Catalogue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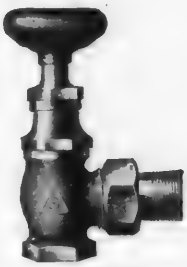

Style 38

ALL OF THEM DANDIES!

Send for the catalogue which tells about these new style valves.

SYRACUSE FAUCET AND VALVE COMPANY

Office and Factory
Syracuse, N. Y.

Sweet's Catalogue Page 1249
GEO. A. WELD CO., 79 Milk Street, Boston

220-224 West 42nd St.
New York City

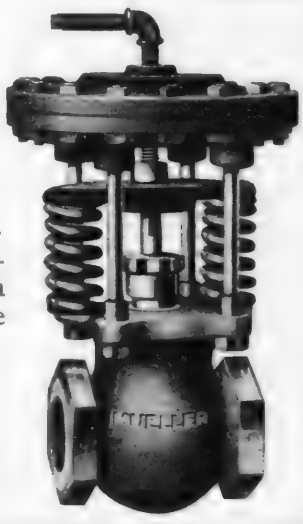
Write it on your order "Mueller"

Then be sure it's on the valve

IT isn't enough to order a reducing and regulating valve—write "Mueller" on the requisition; then insist that you get Mueller quality.

No matter what kind of pressure you are working with—steam, air, oil, gas, water—we have a valve which will not only meet your requirements but will give you absolutely perfect service.

Take the matter up with us—get our No. 5 Catalogue. If you have an annoying pressure problem, take it up with our experts. They will be pleased to advise with you.



H. V.

H. MUELLER MFG. CO.

Send me a copy of your No. 5 Regulator Catalogue.

Signed.....

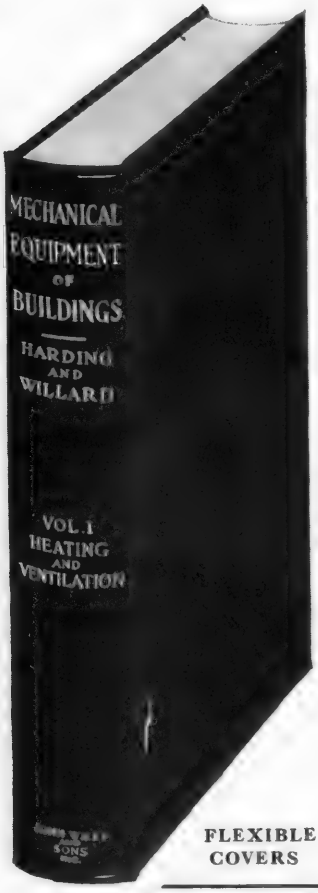
City.....

State.....

All Mueller Valves are Fully Warranted When Installed According to Our Directions

H. Mueller Mfg. Co.

Decatur, Ill.



FLEXIBLE COVERS

Just Published

Mechanical Equipment of Buildings

by LOUIS ALLEN HARDING, B. S., M. E., and ARTHUR CUTTS WILLARD, S. B.

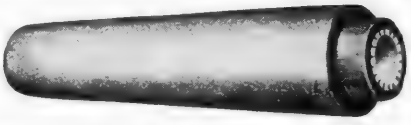
This volume shows the relation between the theoretical principles of the heating and ventilation of buildings and their practical application to actual problems.

Both the engineer and architect will find it a valuable work of reference. It contains the latest information covering this field of engineering. In order to illustrate and facilitate the designing of the various mechanical systems and plants required in modern buildings, the authors have made use of such manufacturers' data as they deem necessary.

621 pages, 7x9¼, illustrated. Leather, $4.00 postpaid.

Heating and Ventilating Magazine Co.
1123 Broadway, New York

STANDARD Steam Pipe Casing



For Insulating Underground Steam Pipe. Tin Lined, or Unlined.

Every salesman has his argument in order to sell the product he represents. Listen to our argument, be the judge, and you will find same not theoretical but practical, and from actual experience.

When you cover your steam line with our make of casing you have the assurance that the line will be constructed so that no heat will escape, and will be water tight as well, with ample space for air chamber.

Should occasion arise that it is necessary to get at the steam pipe, our covering CAN BE TAKEN APART WITHOUT DESTROYING THE STAVES in the sections of casing, and the same casing can be used again. LET US EXPLAIN HOW.

If your line runs in different branches we will build the casing in exact lengths so that you will not have to cut any sections, which means no waste or extra expense to you.

Our method of building covering will be to your interest. Our product is right, attention prompt, and prices low.

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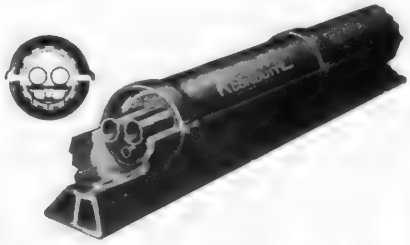
Standard Wood Pipe Co.
WILLIAMSPORT, PA.



The Strongest Evidence

When any product used in construction work comes to be so widely used as the

RIC-WIL METHOD

of Insulating Underground Steam and Hot Water Pipes

it is never by accident—and the fact that RIC-WIL conduit has come to be recognized as standard by so many of the leading architects and engineers in the United States and Canada is the best proof of its real merit.

Write for our booklet—"Ric-wiL Method"

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623 Guardian Bldg., Cleveland

Sell Your Steam for Heating

Our Engineering Department is at your service and will be glad to make and submit estimates covering your requirements

Get the Benefit of 40 Years' Experience

Write us today in regard to the installation of a

Central Station Steam Heating System

or extension to your present underground mains

(Bulletins free on request)

AMERICAN DISTRICT STEAM COMPANY

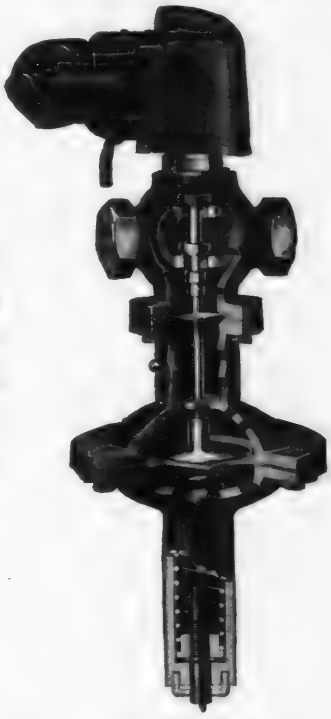
General Offices and Works: NORTH TONAWANDA, N. Y.

NEW YORK CHICAGO SEATTLE

ECONOMY
AND
REFINED HEAT

BOTH FROM ONE VALVE

The **HORNUNG Pressure** and **Temperature Control Valve** employing an electric thermostat of the 8-day Clock type is the Ideal Valve to control a vapor or atmospheric system of Heating where service is taken from a Central Station.



A Post Card will bring you Bulletin No. 12, which tells you more about it

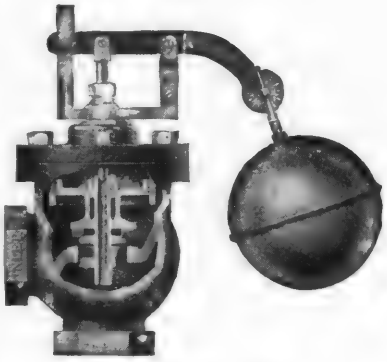
Central Heat Appliances

J. C. HORNUNG

343 South Dearborn Street, Chicago

Patented June 16, 1914

DAVIS VALVES



Davis Float Valve

THE little things that come under your care often give you the greatest annoyance when they go wrong.

You can safely put your faith in a Davis Float Valve. It was designed to operate without trouble and it works as intended.

It has a single seated renewable composition disc—it is tight when closed.

The expense and annoyance of fooling with a leather cup packing is entirely eliminated—only the stem is packed.

Try one of these valves at our risk. Globe and angle patterns.

We make Pressure Regulators, Balanced Valve, Float Valve, Steam Trap, Back Pressure Valve, Exhaust Relief Valves, Stop and Check Valves, Pump Governors, Damper Regulator, Radiator Air Valves, Emergency Stop Valve.

G. M. Davis Regulator Company

436 Milwaukee Ave., Chicago

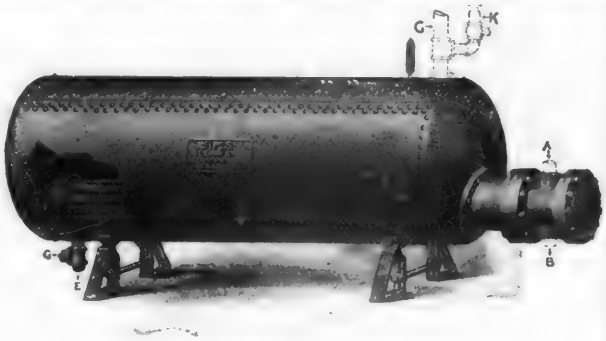
New York, 123 Liberty — Boston, 70 High — Philadelphia, 2218 Vine — The Hartje Bldg., in Pittsburgh — Calvert in Baltimore and Rialto in San Francisco.

Valve Specialty Manufacturers Since 1875

SIMS COOLING COILS

Buildings heated with purchased steam, requiring hot water for general service use the

Sims Clean E-Z



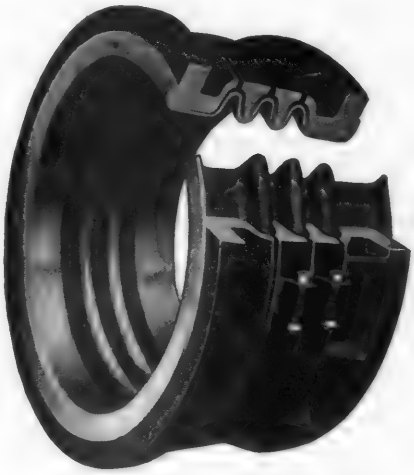
For utilizing waste heat in condensation from radiators, the tubes are arranged in four or more passes, reducing temperature of condensate to that of water entering tank, heating water for general service to satisfactory temperature.

Gas or coal heater may be connected to tank for summer use.

"We Keep Others In Hot Water"

For particulars write

THE SIMS CO., 18th St., Erie, Pa.



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The Elasticity of Copper

and

The Strength of Iron

combine to make the

BADGER EXPANSION JOINT

the most efficient fitting obtainable

FOR PIPE EXPANSION

Simply a corrugated copper tube, flanged and reinforced by iron rings which distribute the strain evenly over all the corrugations.

NEVER NEED PACKING **NO CHANCE FOR LEAKS**

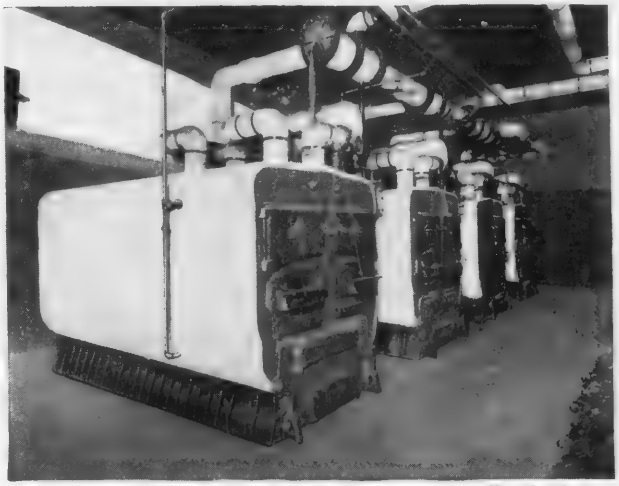
Write for our booklet

E. B. BADGER & SONS CO.

BOSTON **NEW YORK**

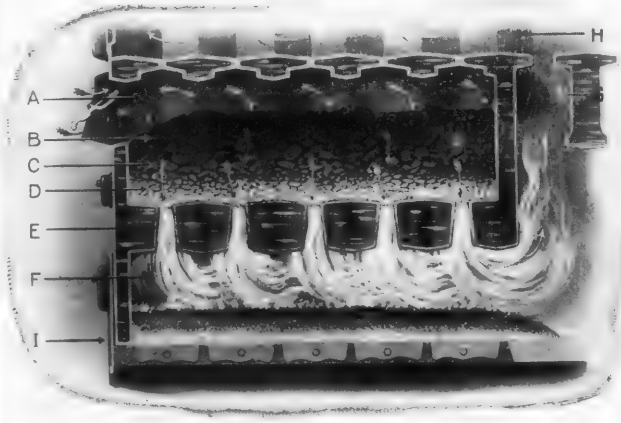
Smokeless heat for largest buildings

The sectional boiler is daily growing in favor for use on extra large heating installations. The success of these big heating plants is a striking recommendation.



Battery of IDEAL SMOKELESS Down-Draft Boilers in the Manchester School, Pittsburg, Pa.

IDEAL SMOKELESS
Down-Draft Boilers burn soft coal
and heat large buildings at 20% to 50% fuel saving



Cut-away view of the side of an IDEAL SMOKELESS Down-Draft Boiler, showing ample gas spaces through the water grate, and the processes of smokeless combustion of soft coal

Following are only a few typical large installations where these IDEAL Sectional Boilers burn the cheap grades of soft coal without smoke:

Curtis Aeroplane Works, Buffalo, N. Y.
86,200 square feet of Boiler Capacity.
Manchester School, Pittsburg, Pa.
42,300 square feet of Boiler Capacity.
Carnegie Library, North Pittsburg, Pa.
24,000 square feet of Boiler Capacity.
909 Lake Shore Drive Apartments, Chicago.
18,000 square feet of Boiler Capacity.
Overland Service Station, Toledo, Ohio.
32,400 square feet of Boiler Capacity.

Perhaps you would like further and special information for some large problem you have in hand? If so, we will gladly furnish it. Send for catalog.

AMERICAN RADIATOR COMPANY

Branches in most large cities

company's growth which has made it necessary to build a second, new addition to the factory, fronting on Wells Street. The new addition will house the forge shop and the heavy punchings and notching presses used in the manufacture of Ilg motors.

Business Troubles.

P. J. Sullivan Co., Boston, Mass., has filed a petition in bankruptcy, with liabilities of $63,731 and assets estimated at $22,160. There are about 230 unsecured creditors.

New Incorporations.

C. A. Bruhns, Inc., New York, capital $15,000, to conduct a realty and heating and plumbing supply business. Incorporators: M. A. Coyle, W. C. Bruhns and C. A. Bruhns, 152 Amsterdam Ave.

Bernhard Boiler Co., Boston, Mass., capital $25,000. Incorporators: Frederick N. Le Baron, W. Newton, L. S. Le Baron and G. L. Le Baron.

Steel Ventilouvre Co. of America, New York, capital $500,000, to manufacture ventilators, transoms, etc. Incorporators: J. P. Goodhart, W. C. Lange and C. M. Wills, 25 West 42nd St.

Compound Heater Mfg. Co., Long Island City, N. Y., capital $50,000, to manufacture heating specialties. Incorporators. E. T. Koch, E. Fisher and W. E. Fisher, all of 67 Sixth St., Long Island City.

Dumore Heating and Ventilating Co., St. Louis, Mo., capital $50,000 to do contracting work. Incorporators: George A. Deemar, Henry V. Deemar, Michael Jerca, John W. Leimberger and John W. Marx.

American Supply Co., St. Paul, Minn., capital $50,000, to deal in heating and plumbing supplies. Incorporators: Fred J. Camitsch, Frank H. Merrill, A. Zurn and Joel E. Gregory, all of St. Paul.

Waukoria Mfg. Co., Wilmington, Del., capital $10,000, to manufacture heating and ventilating specialties.

Munkenbeck Bros., Inc., Brooklyn, N. Y., capital $10,000, to manufacture heating and plumbing specialties. Incorporators: F. A. C. Munkenbeck and T. T. Munkenbeck, 88 Hamilton Avenue, Brooklyn.

General Plumbing & Supply Co., Martinsville, Ind., capital $10,000, to deal in heating and plumbing supplies. Directors: Walter A. Kennedy, Robert H. Egbert, E. S. Kriner and L. H. Prath.

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Rotary Ball-Bearing Ventilators

Sturtevant
(REG. U.S. PAT. OFF.)
Autoforce Ventilator

is unique in that it uses wind pressure to create a positive, powerful suction that draws air from the building. It operates on the same successful principle as the steam injector and the Hancock inspirator.

It will remove three times as much air as any stationary ventilator of the same size, and twice as much as other ventilators of the swinging cowl type. A small Autoforce will do the same work as any other ventilator several times as large.

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Wood Wheel Packless Valve

There is No Better Valve Than The Lavigne Packless Quick-Opening Steam Radiator Valve

The valve is recommended to discriminating users for these fundamental features;—

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It positively does not leak air, water or steam.

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It is built on honor throughout.

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It is a beautiful, well balanced, handsomely finished valve.

It is at once an ornament and a necessity on every good job.

Made in six sizes—many styles—Ask your jobber for details.

Lavigne Manufacturing Company

Detroit, Mich.

Contracts Awarded.

Powers Heating and Ventilating Co., Boston, Mass., installing new boiler plant and central heating plant for the West Department of the City Hospital.

Johnson & Morris, New York, heating $300,000 loft and service building for A. M. Napier & Co., Greenwich and Veseys Sts., New York.

G. F. Higgins & Co., Pittsburgh, Pa., heating and ventilating new George Westinghouse High School for $122,206. The plumbing contract went to the Buerkle Plumbing Co., at its bid of $89,920.

Gillis & Geoghegan, New York, heating loft building for Vincent Astor at 102-108 West 19th St., New York.

Bryce Heating & Ventilating Co., Toledo, O., heating and ventilating high school at Birmingham, Mich., for $23,000; also heating and ventilating high school at Plymouth, Mich., for $17,000; high school at Marion, O., for $17,000 and the State Normal College at Bowling Green, Ky.

J. J. Hurley, Boston, Mass., heating and ventilating new junior high school at Somerville, for $10,274.

MacMahon Plumbing & Heating Co., Kansas City, Mo., heating and plumbing Sinclair Oil and Gas Building, at Tulsa, Okla., for $35,000.

Rhodes & Troyer, Logansport, Ind., heating and plumbing Monticello Thread Mills at Monticello, operated by Marshall Field & Co., for $15,000.

W. R. Renny, Grants Pass, Ore., heating and plumbing Josephine County Court House, for $7,057. Other bids were: heating, T. M. Barr, Portland, $3.300; Kendall Heating Co., Portland, $4,178; Finnegan Bros. Portland, $3,964.

R. Gildea Syracuse, N. Y., heating and ventilating Potsdam Normal School, at Potsdam, N. Y., for $30,000. Bradley &

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are manufactured in sizes from ¾ H. P. to 40 H. P.

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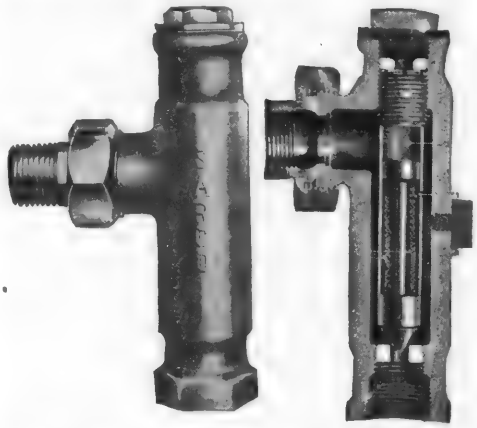

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The moment steam comes in contact with cartridge, the oil expands, closing trap—condensation forming creates a contraction opening trap. Positively no chance of water hammer or air binding, and will maintain a perfect vacuum in radiator.

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F. W. Spencer & Co., Salt Lake City, Utah, heating and ventilating Liberty School, in Salt Lake City, for $9,998.

Business Chances.

Clinton, Mass.—A proposition to build a central heating plant in Clinton to care for all of the public buildings in the center of the town is under consideration by the town officials.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until January 19, 1917, for the construction complete of the U. S. Post Office at Charlotte, Mich.

Until Janury 22, 1917, for the construction complete of the U. S. Post Office at Richfield, Utah.

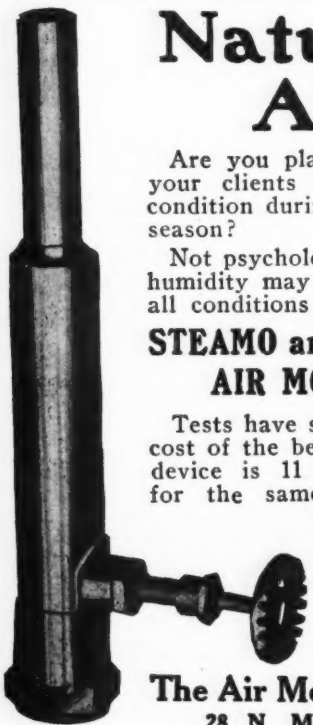
Drawings and specifications may be obtained from the custodians on the sites or from the office of the Supervising Architect, James A. Wetmore.

Wanted.

Position Wanted.—Superintendent of power, heating and ventilating plants and district heating plants; sales engineer of steam power machinery and heating and ventilating apparatus; expert on design and installation, now employed, is open for an engagement after January 15, 1917. Address Superintendent, care of Heating and Ventilating Magazine.

Wanted—Engineering draftsman, capable of estimating and designing heating and ventilating and power plants. Address, giving all particulars, salary, etc., Gorman, care of Heating and Ventilating Magazine.

According to Charles P. Steinmetz, the well-known electric expert, "electricity will become so universally used that the housewife will wash dishes and clothes, cook the dinner, heat the house and even sweep the floor electrically. In a few years huge generating plants, besides supplying city homes, will carry current to every home within a radius of fifty miles."



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Tests have shown that the cost of the best evaporating device is 11 times greater for the same quantity of moisture than that of the Steamo Air Moistener.

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Solves the problem of the small heating unit

The Sturtevant set consists of a motor-driven Multivane Fan discharging air through heating coils placed in an aluminum casing. The inside of the casing acts as a diffuser—Set can be used with or without heating coils.

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VOL. XIV. NO. 2

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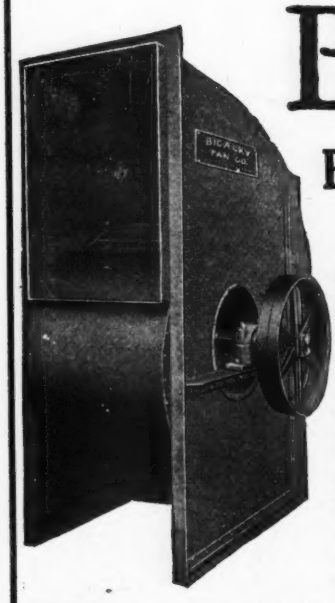

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